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GEOLOGICAL SURVEY

RELATION OF URANIUM AND PHOSPHATE
IN THE PHOSPHONIA FORMATION

by
V. F. McElroy

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RELATION OF URANIUM AND PHOSPHATE
IN THE PHOSPHORIC FORMATION

V. L. McElroy

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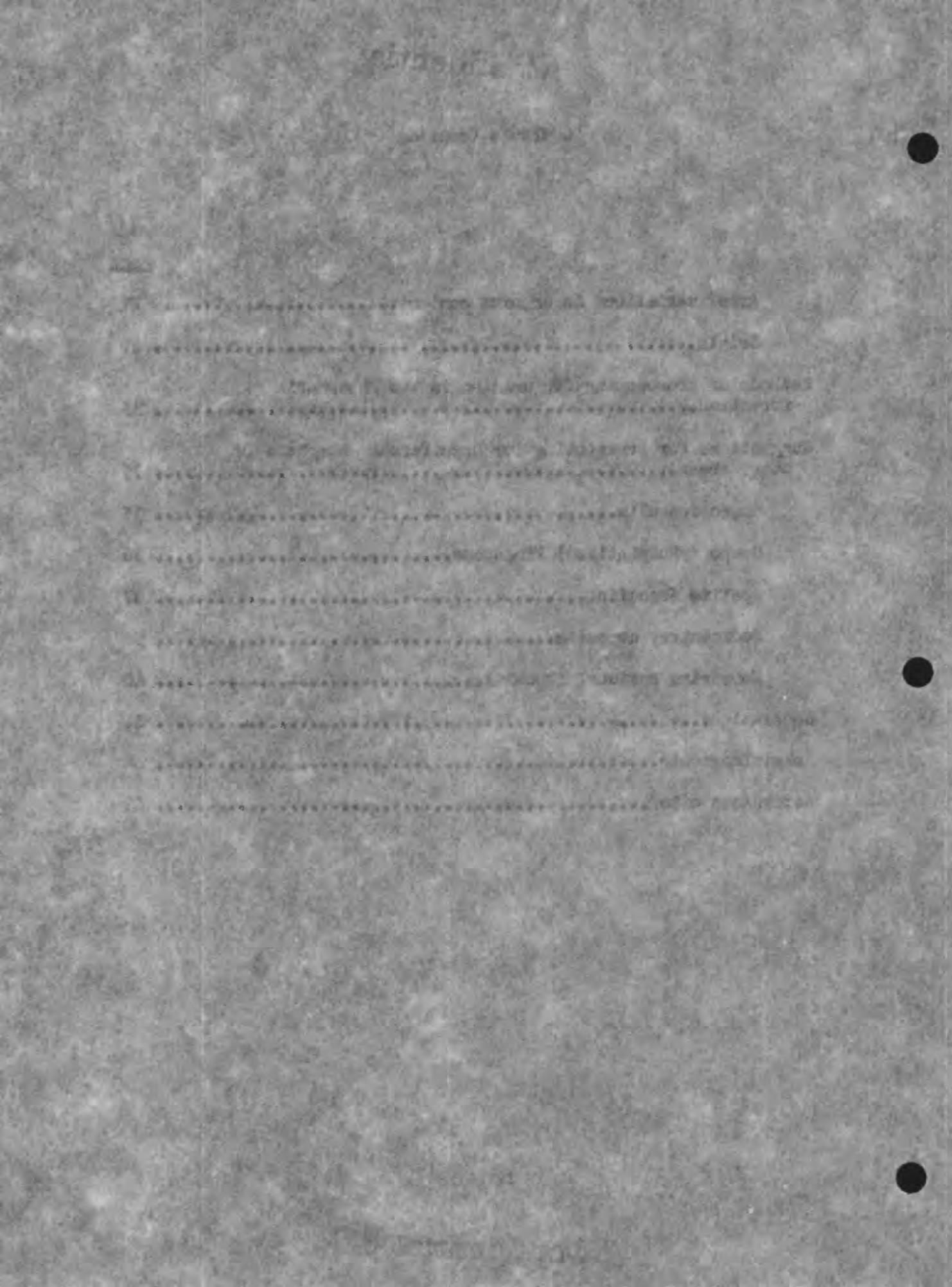
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As a result, the new system will be able to identify and track individual patients more accurately, leading to better treatment outcomes and improved patient safety.

19. The following is a list of the names of the members of the Board of Directors of the Company.

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ABSTRACT

The Phosphoria formation and its close stratigraphic equivalents extend over an area of some 100,000 square miles in Montana, Idaho, Wyoming, Utah, and Nevada. In the eastern part of the field the geologic structure is simple, and pre-Cretaceous rocks are thin; but west of a line approximating meridian 111° the structure is complex, and the pre-Cretaceous rocks are thick. This boundary, by reason of combined structural, stratigraphic, and petrologic evidence, is taken as essentially that between the Cordilleran miogeosyncline to the west and its platform to the east. The thickest and highest quality phosphate deposits are confined to the area slightly to the west of meridian 111° and are thought to have accumulated near the edge of the shelf, presumably where ascending deep cold waters, rich in CO₂ and phosphate, became more alkaline because of a decrease in partial pressure of CO₂ and an increase in temperature.

Some of the highly phosphatic beds of the Phosphoria formation contain 0.01-0.02 percent uranium. Although many highly phosphatic beds are only weakly uraniferous, the most highly uraniferous beds are all highly phosphatic and it seems certain that the uranium is in or attached to the phosphate mineral. A strongly negative relationship exists between uranium and carbon dioxide, for of the rocks containing 0.01 percent or more uranium, none contain more than about 2 percent carbonate CO₂. It seems probable that some of the same CO₂ relationships that controlled the precipitation of the phosphate also

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Language

and the first stage of the project were to measure those variables directly from the data, and to identify and test for the relationships between them. The second stage involved the construction of a model of the system, and the third stage involved the validation of the model. The fourth stage involved the use of the model to predict future trends and to evaluate the impact of different policy scenarios. The fifth stage involved the use of the model to identify potential policy interventions and to evaluate their likely impact. The sixth stage involved the use of the model to evaluate the overall performance of the system and to identify areas for further research and development.

LITERATURE

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affected the solubility of uranium in the sea water. Although it seems unlikely that the sea was at any place saturated with uranium as it was with phosphate, uranium may have been selectively removed from the sea water by adsorption on precipitated phosphates.

Little is known about the occurrence of uranium in other types of phosphate deposits, but, in view of the frequent association of uranium with phosphate, not only in the bedded phosphorites, but in many other minerals and compounds, other phosphate deposits should be tested. The guano, guano (leached) limestone, and the nonmarine residual deposits appear less promising as sources of uranium than do the marine sedimentary deposits and the "vein" apatite deposits.

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ЛІКУВАННЯ

Важливо знати, що терапевтичні методи використовуються не тільки для лікування хвороб, але і для підтримання здоров'я. Важливо знати, що відсутність проблем не означає, що все відбувається нормально. Іноді проблеми можуть бути складнішими, ніж звичайні хвороби. Але вони є, і вони потребують уваги та підтримки. Важливо знати, що відсутність проблем не означає, що все відбувається нормально. Іноді проблеми можуть бути складнішими, ніж звичайні хвороби. Але вони є, і вони потребують уваги та підтримки.

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INTRODUCTION

Some of the highly phosphatic beds of the Permian Phosphoria formation of the Northwestern States contain 0.01-0.02 percent uranium. They are similar in this respect to some of those in other important phosphate-bearing formations, such as the Pliocene Bone Valley formation of Florida; the Cretaceous and Eocene phosphorites of Algeria, Tunisia, Morocco, and Egypt (Hébert); the Cretaceous phosphorites of the Iveta River region, and the Tertiary phosphorites of the Volak region of Russia (Rusakov).

Of the many other phosphorite deposits, few if any in this country, and probably elsewhere as well, have been tested adequately for uranium.

Although detailed studies of the uranium in the Phosphoria formation are under way, they have not yet progressed far enough to reveal the origin, and mineralogy of the uranium, or even the nature of its habits and variations. Nevertheless, the information at hand may help guide the search for uranium in other types of deposits. It is the purpose of this paper, therefore, to summarize the data on the geology of the Phosphoria formation and its uranium deposits, as well as methods currently used in prospecting the formation for uranium; and to make some suggestions for prospecting other types of deposits for uranium.

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Aboriginal culture and traditional skills can be
used to help communities and individuals respond to the challenges
posed by climate change. In fact, many Aboriginal communities have
been responding to climate change for centuries. For example, the
Inuit have developed unique ways of adapting to changing environments.
They have learned to live in harmony with their environment and to use
natural resources sustainably. They have also developed effective
strategies for dealing with extreme weather events, such as blizzards
and storms. These strategies include building houses that are well-insulated
and designed to withstand harsh conditions, and developing
agricultural techniques that are adapted to the local environment.
In addition, Aboriginal communities have developed strong
cultural traditions that emphasize respect for the natural world and
the interconnectedness of all living things. These traditions provide
a foundation for sustainable development and adaptation to
climate change.

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REGIONAL GEOLOGY
OF THE WESTERN PHOSPHATE FIELD

The Phosphoria formation, and its partial stratigraphic equivalent, the Park City formation, extends over an area of some 100,000 square miles in Montana, Idaho, Utah, and Nevada (fig. 1; McElvay). That part of this area lying west of approximately meridian 111° is the eastern part of the Cordilleran megasyncline (May; Cardby); and the area to the east is the bordering shelf or platform area. The stratigraphy and structure of these areas are markedly different (fig. 2).

The geosynclinal portion of the field is characterized by several tens of thousands of feet of marine sediments, including rocks of very period from Cambrian to Jurassic. These rocks consist mainly of limestone, dolomite, and clean quartz sandstone, but minor amounts of other chemical precipitates, such as phosphate, are present also. Sediments of post-Jurassic age are dominantly continental clastics, largely restricted to intermontane basins.

The structure of the geosynclinal area is complex. It is characterized by steep dips and tight, closely spaced folds, many of which are overturned to the east, and most of which have a parallel strike and are continuous for miles. Overthrust, reverse, and transverse faults of both large and small displacement are abundant--in fact many segments of the Phosphoria are so crushed and broken by faults as to be unsuitable for mining. Normal or valley faults of large displacement and relatively recent origin are abundant also. Worthy of note too are large granitic intrusives of Cretaceous and Eocene age (e.g. the Idaho and Boulder batholiths) and widespread lava flows of Miocene and Pliocene age.

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Introduction

Gottlob Frege

Country

Country is a term used to describe a nation or state. It refers to a political entity that has its own government, territory, and population. Countries are typically defined by their borders, which are often marked by rivers, mountains, or coastlines. They may also have internal boundaries, such as state or provincial boundaries. Countries are usually independent entities, although some are part of larger political unions, such as the European Union or the United Nations. The word "country" can also refer to a specific region or area within a country, such as a county or a state.

Country

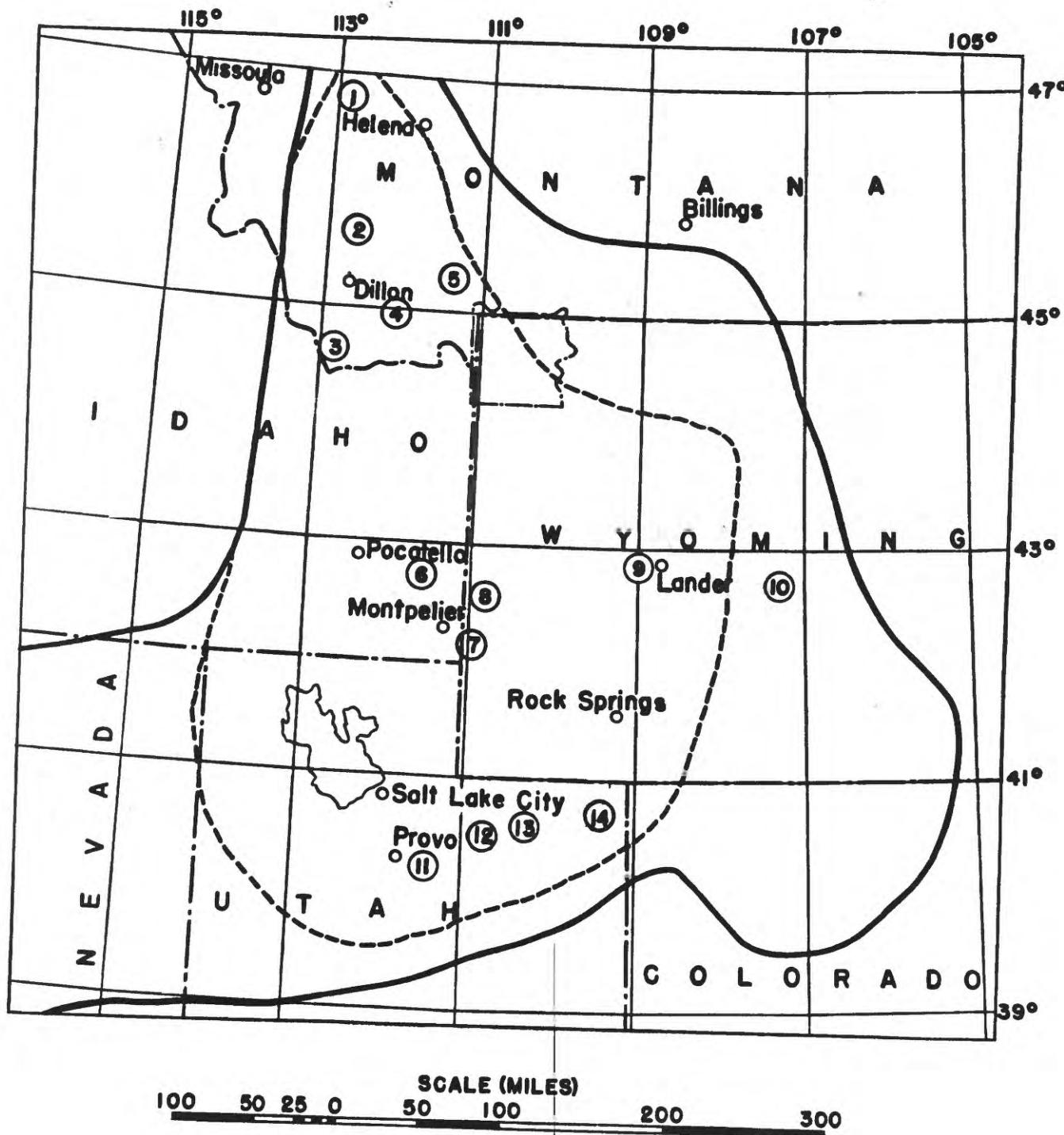
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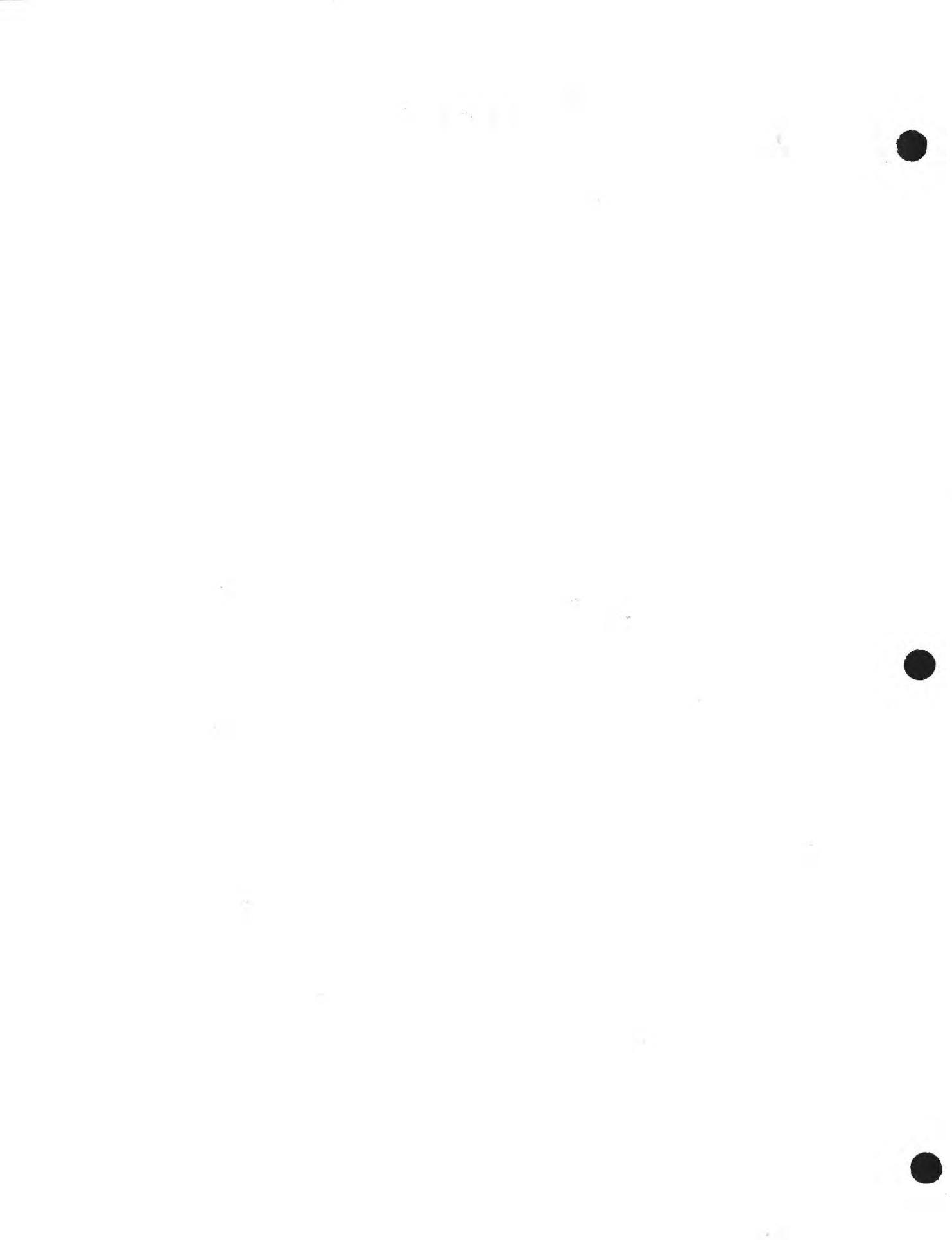
Figure 1

Index map of the western phosphate field, showing limits of the Fowlersoria, York City, and other formations (solid line) and their phosphate dolomite (dashed line). The eastern and southeastern boundaries shown on the map represent fairly accurately the true limits of the time of deposition. The western limits at the time of deposition cannot now be accurately reconstructed because the original rocks there either have been eroded away or are concealed beneath thrust plates of older rocks. The southern and southwestern limits are now poorly defined because not enough phosphate-bearing beds have been dug to differentiate the facies of the Jordanian Fowlersoria Formation from those of the Kaibab limestone, Cerritos Formation, and Aransas formation and other western facies which may be at least partial age equivalents. Numbers show the location of measured sections on figures 3, 4, and 5.

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Fig. 1





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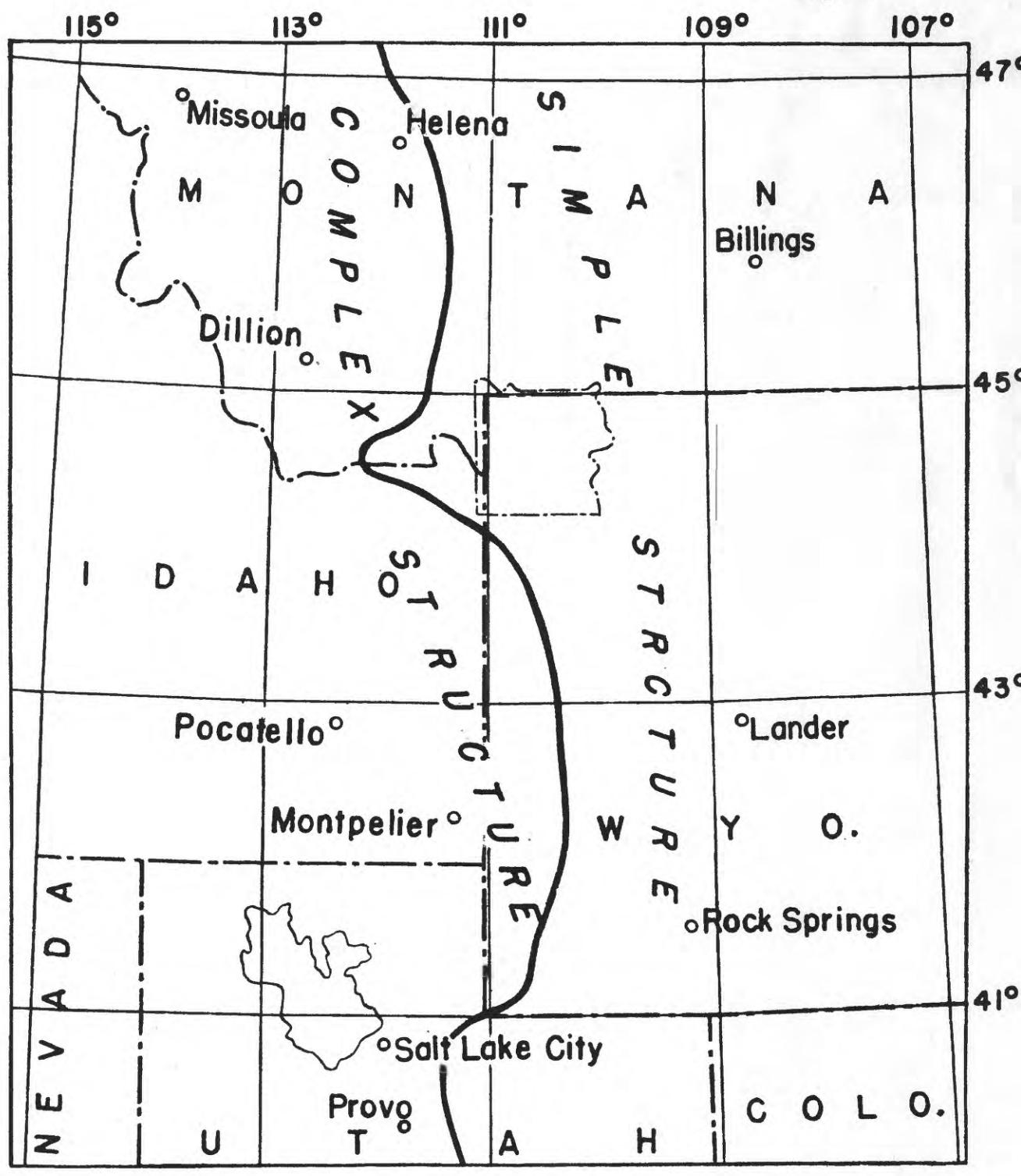
The pre-Cretaceous rocks of the shelf area resemble those of the geosyncline in general lithology. Detritus, especially quartz sandstone, forms a greater part of the section, however, and non-marine clastics and evaporites are interbedded with the marine sediments. The shelf rocks are much thinner than those of the geosyncline, and are measured in thousands rather than tens of thousands of feet. Gaps in the stratigraphic record, some representing the duration of a full geologic period, are present in parts of the area. The post-Jurassic sedimentary rocks of the shelf are widespread in distribution and consist of tens of thousands of feet of mostly non-marine detritus (including much conglomerate and dirty sandstone), coal, evaporites, and minor amounts of carbonate rocks.

The structure of the shelf area is simple. Dips are gentle and most of the folds are broad, open, and without dominant orientation. Although some faults, including thrusts, occur, large areas are unfaulted. Most of the intermontane basins are synclinal, and block-fault basins are rare or absent. A few granitic intrusions are present, but most of the exposures of granite in the shelf area are a part of the pre-Cambrian basement. Tertiary volcanic rocks are found in many places near the geosynclinal border of the area, but are sparsely distributed elsewhere.

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Correlation

Fig. 2



Boundary between areas of simple and complex structure in the northern
Rocky Mountains.



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GEOLOGY OF THE PHOSPHORIA FORMATION

General relations

At its type locality in southeastern Idaho (Richards and Mansfield), the Phosphoria formation consists of a lower, phosphatic shale member, about 180 feet thick, and an upper member, the Rex Chert, 240 feet thick; a third member, a cherty mudstone or shale 15 to 75 feet thick, overlies the Rex in most of southeastern Idaho and western Wyoming, though it is not well defined at the type locality of the Rex member in the Crawford Mountains of Utah (Gale and Richards). The Phosphoria is underlain by the Wells formation, the uppermost 50-100 feet of which consists of limestone (in part cherty and sandy) and the remainder of which is largely sandstone. The Triassic Dinwoody formation, which consists mainly of calcareous siltstone, overlies the Phosphoria formation in southeastern Idaho, but tongues cut into nonmarine red beds of the Woodside formation to the east and south.

These units of the Phosphoria formation are easily recognizable over a wide area in Idaho and adjacent areas, but in central Wyoming the whole aspect of the formation is different, for it is thinner and contains a greater proportion of sand and carbonate and much less phosphate and shale (fig. 3). Farther east, in southeastern Wyoming, the phosphate is entirely absent, and the formation tongues out into non-marine red beds of the lower Chugwater formation (Thomas). Although the better known phosphate deposits lie east of Fort Hall in Idaho, the Phosphoria formation has been identified further west near Malta, Idaho (Anderson, pp. 35-37). Both the lower phosphatic shale and the Rex chert

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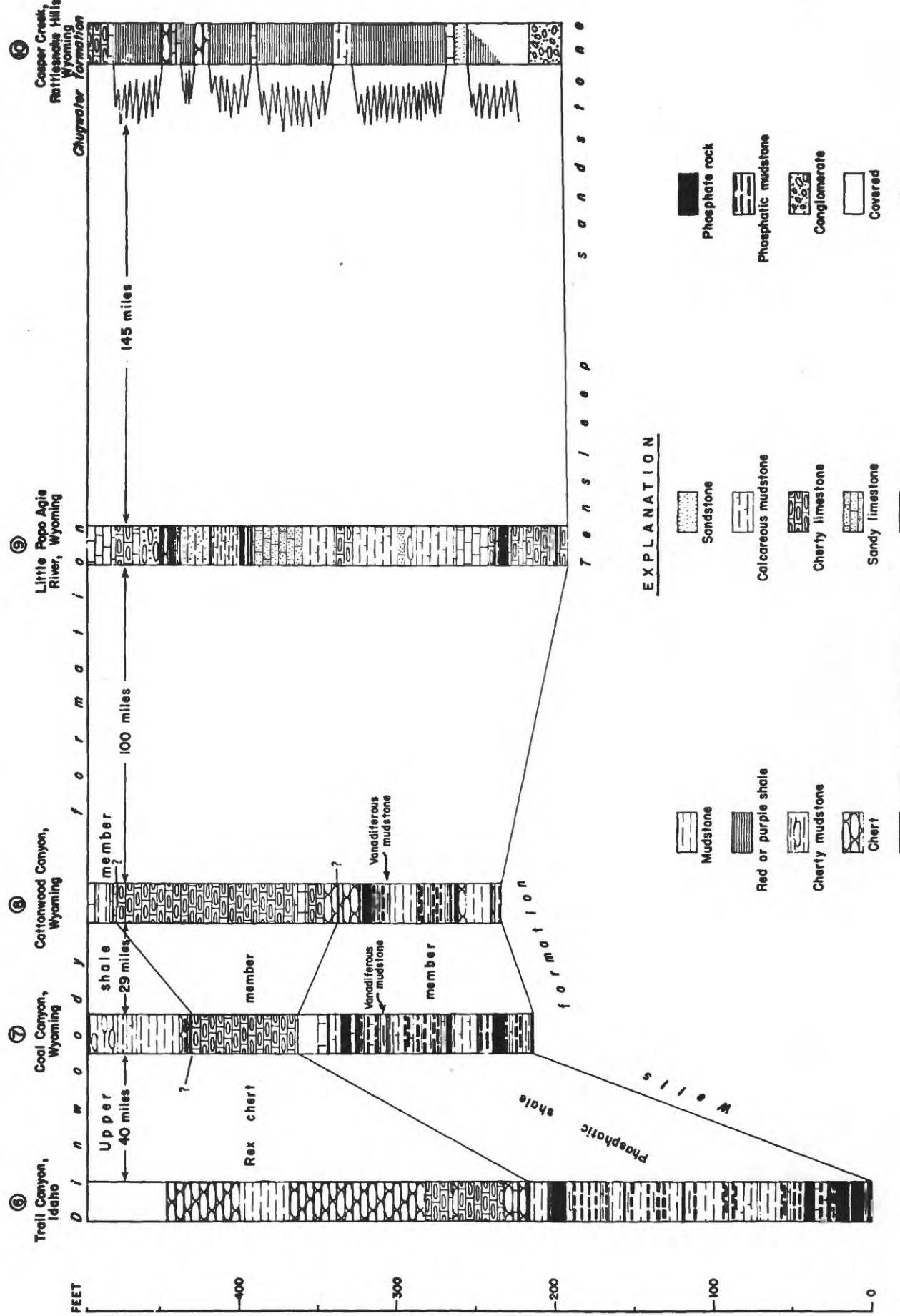
Figure 3

Typical sections of the Phosphoria formation in Wyoming and Idaho. The Rattlesnake Hills section was measured by H. D. Thomas (1934); the Lander section by Ralph H. King (1947); the Salt River Range section by J. D. Love and L. E. Smith; the Coal Canyon section by V. E. McKelvey, and the Trail Canyon section by L. E. Smith, R. A. Hoppin, and V. E. McKelvey, all of the U. S. Geological Survey.

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Fig. 3





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are reported to be present there and to total about 900 feet in thickness (Bakar and Williams). The quality and thickness of the phosphatic beds, however, are unknown.

The westward thickening of the Phosphoria formation is displayed in other states and so, to some extent, are the other lithologic variations. In Utah, the stratigraphic unit known as the Park City formation is the partial equivalent of the Phosphoria, and at Park City, its type locality (Boutwell), it lies between the Carboniferous (Pennsylvanian) Weber quartzite and red beds of the Triassic Woodside formation (fig. 4). It consists of a lower, cherty limestone member, which may be the stratigraphic equivalent of the Wells formation in southeastern Idaho; a middle shale member, which is somewhat phosphatic, but contains no high-grade phosphate beds, equivalent to the phosphatic shale in southeastern Idaho; and an "upper Productus limestone", equivalent to the Rex chart of southeastern Idaho. Eastward, the lower member thins out, the phosphate deposits disappear, and the shale and upper limestone members are more clastic and finally tongue out into nonmarine red beds in eastern Utah and western Colorado (Thomas and Krueger). As in Idaho, the Park City thickens greatly to the west. In the Confusion Range, near the western border of Utah, the formation is 4,500 feet thick, but its phosphate content is unknown (Newell, 1948).

In southwestern Montana, the Phosphoria formation consists of two to five lithologic units, provisionally termed units A, B, C, D, and E (fig. 5). Unit A, at the base, consists of a sequence of cherty carbonate and clastic rocks; unit B, of phosphate rock and phosphatic mudstone; unit C, mainly of carbonate rock; unit D, of phosphatic mudstone;

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Contingency

contingency is a situation in which the outcome of an event depends on one or more other events. In other words, the outcome of an event is not guaranteed and can depend on various factors. Contingency can be used to describe situations in business, politics, science, and everyday life.

In business, contingency planning involves preparing for potential risks and uncertainties that may affect the company's operations. This can include preparing for economic downturns, changes in regulations, or competition from new entrants. Contingency planning helps companies to be prepared for unexpected events and to respond effectively when they occur.

In politics, contingency planning involves preparing for potential political crises or conflicts. This can include preparing for elections, negotiating with other countries, or responding to international crises. Contingency planning helps political leaders to be prepared for unexpected events and to respond effectively when they occur.

In science, contingency planning involves preparing for potential experimental outcomes. This can include preparing for equipment failures, sample contamination, or unexpected results. Contingency planning helps scientists to be prepared for unexpected events and to respond effectively when they occur.

Contingency can also be used to describe situations in everyday life. For example, if you are planning a vacation, you might consider contingencies such as bad weather, lost luggage, or delays in transportation. By preparing for these contingencies, you can ensure that your vacation remains enjoyable even if unexpected events occur.

Contingency

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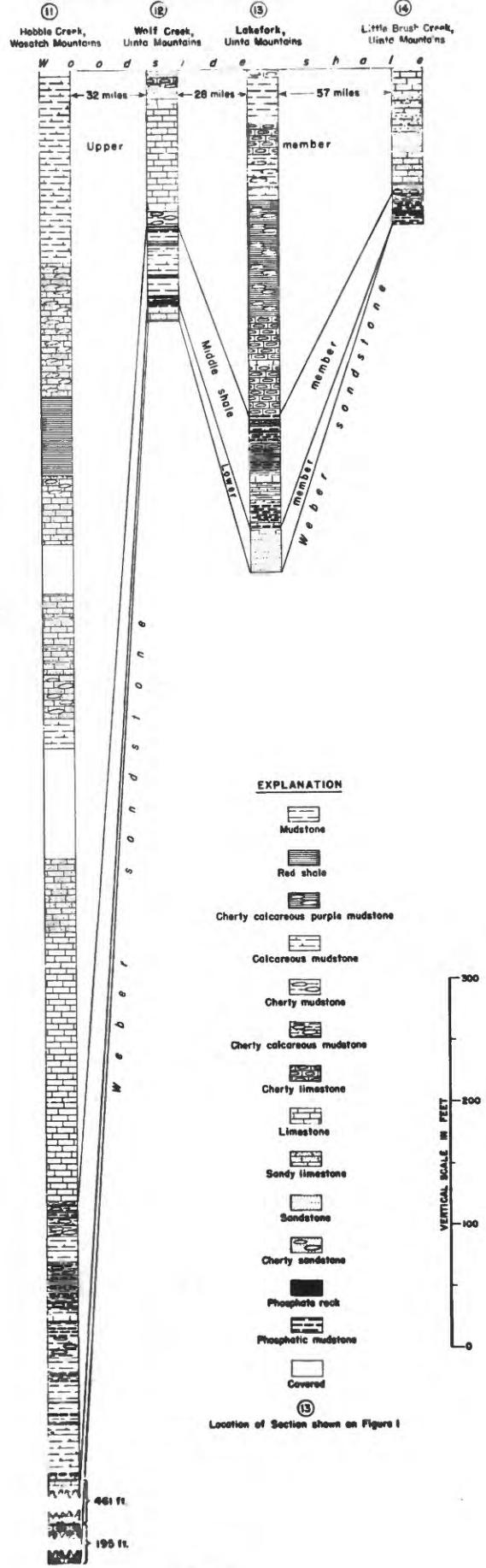
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Figure 4

Typical sections of the Park City formation in Utah. The Little Brush Creek section was measured by D. M. Kinney; the Lake Fork and Wolf Creek sections by J. W. Huddle; and the Hobble Creek section by A. A. Baker, R. S. Sears, M. D. Stewart, G. F. Hosford, and D. P. Sprouse, all of the U. S. Geological Survey. Note: the line at the top of the Park City formation may not be the same time-line at every locality, for the upper part of the Park City formation tongues out into red beds similar to the Woodside shales in the eastern part of the area; see Thomas, H. D. and Krueger, M. L.

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Fig. 4



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and Unit E, of chart. In the Centennial Range unit E is overlain by a thin section of dark mudstone, which has not been recognized elsewhere in Montana. Unit A may prove to be the stratigraphic equivalent of the upper part of the Nalls formation in southeastern Idaho and the lower limestone member of the Park City formation of Utah; units B, C, and D may be equivalent to the phosphatic shale member; and unit E to the Rex member. In the vicinity of Dell and Lima the total thickness of the Phosphoria is 485 feet. The clastic-carbonate sequence (unit A), the lower phosphate (unit B), and the lower carbonate (unit C) disappear eastward in the Madison Range and northward in the Garrison-Drummond area.

In summary, the Phosphoria formation along the eastern margin of the marine basin in which it was deposited contains no phosphatic rocks and consists of marine layers, principally carbonate and sandstones, interbedded with nonmarine red beds. Westward, as in central Wyoming and eastern Utah, thin phosphatic rocks are interbedded with limestones, mudstone, and sandstones; still farther west, as in western Utah and south-eastern Idaho, the formation thickens, and the bulk of it is composed of chemical precipitates (limestone and phosphate rock), very fine detritus (clay and silt), and organic matter.

These westward changes in facies and thickness of the formation are similar to those of many other of the Paleozoic and early Mesozoic formations. It is noteworthy that throughout much of the area the most pronounced changes in the Phosphoria as well as many of the other formations take place in the vicinity of meridian 111° , the approximate boundary between the platform or shelf and the geosyncline.

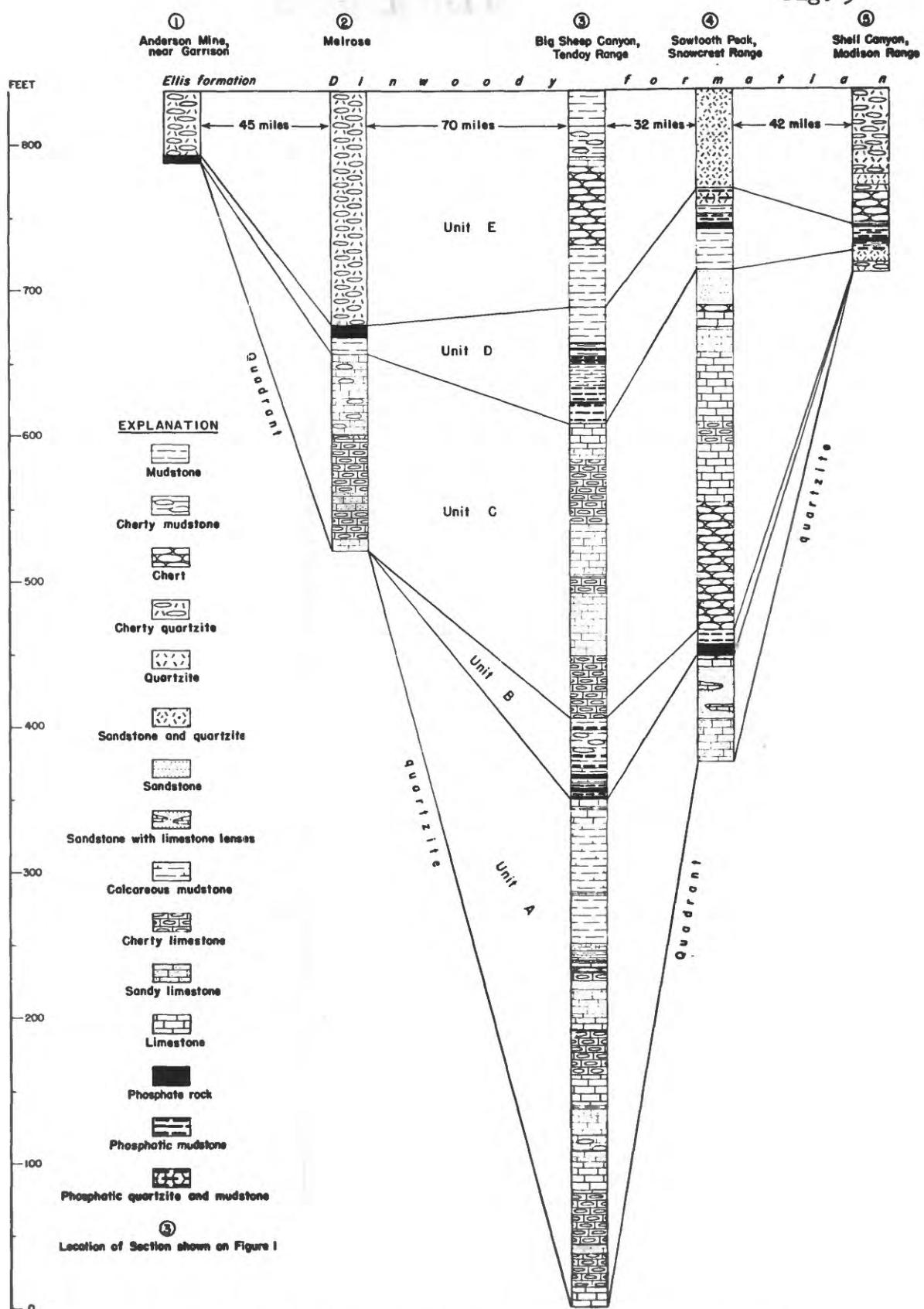
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Comments

It is not clear how much time is available for the study of the
medieval literature. Care must be taken, however, to stress the importance of
the medieval period as a period of great cultural and political
development and of great literary achievement. The study of the
medieval period must be kept brief, but it should be made to include
as many of the great medieval figures as possible, and their contributions
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and their contributions should be emphasized.

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Fig. 5



TYPICAL SECTIONS OF THE PHOSPHORIA FORMATION IN MONTANA

The Madison Range section measured by R. A. Swanson; Sawtooth Peak section by F. S. Honkla and O. A. Payne; Dell section by W. R. Lowell; and the Melrose and Garrison sections by M. R. Klepper; (all of the U.S. Geological Survey). Stratigraphic correlation by M. R. Klepper

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Age

Most Permian specialists now agree that the phosphatic shale member of the Phosphoria formation is equivalent to part of the Guadalupe series (Kazanian) and possibly part of the Leonard series (Artinskian and Kungurian) as well (Miller and Cline; Miller and Furnish; Newell; Thompson, et. al.; Licharew, in Williams, 1938). The age limits of the Phosphoria have not been established but Baker and Williams (1940) class the lower member of the Park City formation in the area near Provo, Utah, as Maibab (Leonard); Frenzel and Munderoff (1942) define beds at the base of the Phosphoria or top of the underlying Quadrant in the Three Forks, Montana, area as Wolfcamp; and Newell and Kummel (1942) have shown that the overlying Dinwoody formation in southeastern Idaho is probably upper Otoceratan—i.e. early, but not earliest, Triassic. Baker and Williams and later Frenzel and Munderoff recognized the possibility that the base of the rocks of Phosphoria lithology may not be the same age everywhere.

Even though the upper and lower age limits of the Phosphoria formation are uncertain, without question it represents a major portion of Permian time.

Lithology

Composition and mineralogy

Lime, phosphate, silica, carbon dioxide, organic matter, magnesia, alumina, iron oxide, and fluorine, listed in approximate order of abundance, are the principal constituents of the phosphatic shale member in southeastern Idaho and adjacent areas, but in addition more than 25 other elements have been reported (Table 1). The Rex member is composed

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and the other two were 100% correct. The results were similar for the 100% correct condition. The 100% correct condition was significantly better than the 50% correct condition ($F(1, 18) = 10.12$, $p < .01$). The 100% correct condition was also significantly better than the 25% correct condition ($F(1, 18) = 10.12$, $p < .01$). The 50% correct condition was not significantly different from the 25% correct condition ($F(1, 18) = 0.00$, $p > .05$).

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As a result, we have to make sure that our policies are well thought out and reflect the needs of all our citizens.

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and includes a bridge over the river. The village contains approximately 100 houses, mostly two-story, surrounded by trees and shrubs. The houses are built of adobe and wood, with tile roofs. The village is located in a valley, with mountains in the background. The people are engaged in agriculture, raising crops such as corn, beans, and squash. They also raise cattle and sheep. The village is connected to the outside world by a dirt road.

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largely of silica and calcium carbonate. Elsewhere the principal constituents of the formation as a whole are probably silica and calcium and magnesium carbonate, and the other constituents are present in only minor quantities.

The principal minerals of the Phosphoria formation are quartz, minerals of the fluorapatite group, calcite, dolomite, and clay minerals. Two fluorapatite minerals, both having the same X-ray structure and chemical composition, have been identified. One is an isotropic-appearing mineral described as collophane; the other is a birefringent mineral whose optical properties are those of francolite (approximately $10\text{CaO} \cdot 3\text{P}_2\text{O}_5 \cdot \text{CaF}_2 \cdot 8\text{H}_2\text{O}$). Other minerals, present in most places in minor amounts, are mica, feldspar, purple fluellite, pyrite or marcasite, glauconite, which is present in the platform facies only and not yet recognized in the geosynclinal area, and a number of secondary vanadium minerals, such as heusittite ($\text{CaO} \cdot 3\text{V}_2\text{O}_5 \cdot 9\text{H}_2\text{O}$), pascoite ($2\text{CaO} \cdot 3\text{V}_2\text{O}_5 \cdot 11\text{H}_2\text{O}$) and sincosite ($\text{CaO} \cdot \text{V}_2\text{O}_4 \cdot \text{P}_2\text{O}_5 \cdot 5\text{H}_2\text{O}$).

Efforts to identify the mineral that carries the vanadium and other minor metals in unaltered rocks have been unsuccessful, principally because these minerals are so exceedingly fine-grained and so obscured by organic matter that they cannot be studied microscopically. Chemical analyses, interpreted by W. W. Rubey, indicate that the vanadium is probably in a clay mineral (hydromica), and the occurrence in the clayey rocks of the formation of some of the other minor metals, such as nickel, zinc, and chrome, makes it seem probable that some of the other metals occur in clay minerals too. Although minor amounts of these metals are found in some of the phosphate rocks, it is certain that they are not

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Letter 10

Dear John and Anna, I am writing you from within the walls of a
small town in Germany, and will do my best to make this letter
short so that you will receive it quickly. We are now staying here
in a small hotel, which is very comfortable and has a nice view.
The town itself is quite small, with only about 1000 inhabitants,
but there are many interesting sights to see. We have just visited
the local church, which is quite old and has some beautiful stained
glass windows. There is also a small museum dedicated to the history
of the town, which contains many interesting artifacts. We have
also been to the local market, and are looking forward to trying
some of the local specialties. The food here is quite good, and we
have been able to find some nice places to eat. We are staying at
a small hotel, which is quite comfortable and has a nice view.
The town itself is quite small, with only about 1000 inhabitants,
but there are many interesting sights to see. We have just visited
the local church, which is quite old and has some beautiful stained
glass windows. There is also a small museum dedicated to the history
of the town, which contains many interesting artifacts. We have
also been to the local market, and are looking forward to trying
some of the local specialties. The food here is quite good, and we
have been able to find some nice places to eat. We are staying at
a small hotel, which is quite comfortable and has a nice view.

Table 1
Elements reported from the Phosphoria formation
(listed in order of maximum amount reported)

	<u>Maximum (percent)</u>	<u>Rock type or bed from which reported</u>	<u>Minimum (percent)</u>	<u>Rock type or bed from which reported</u>
SiO_2	77.02	Chert	none	Phosphate rock
CaO	52.4	Phosphate rock	0.6	Mudstone (vanadiferous zone)
CO_2	43.22	Dolomite	0.04	Mudstone (vanadiferous zone)
P_2O_5	39.6	Phosphate rock	0.05	Mudstone (vanadiferous zone)
Organic matter	25.8	Shale	0.6	Phosphate rock
MgO	20.01	Dolomite	0.03	Cherty phosphate rock
Al_2O_3	14.99	Mudstone	0.08	Chert
Fe_2O_3	10.00	Chert	0.3	Phosphate rock
F	7.0	Phosphate rock (fluoritic)	0.02	Limestone or dolomite
K_2O	5.07	Mudstone	0.06	Phosphate rock
H_2O -	4.47	Mudstone	0.03	Limestone
S	4.1	Mudstone (vanadiferous zone)	none	Dolomite
Sr	1/3.6	Phosphate rock	none	Vanadiferous zone
Na_2O	3.2	Mudstone	0.1	Dolomite
H_2O -	1.4	Phosphate rock	0.6	Phosphate rock
ZnO	1.3	Mudstone (vanadiferous zone)	none	Mudstone

(Table continued on next page)

50-14-407. *Administrative rules.* The state auditor may adopt

新編世界文學名著叢書

Indicates in the text, Grotto, how it is to be used.

2007-08-08

— 10 —

—Lion's Den—
—Theatre Royal—

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Table 1 (cont'd)

	<u>Maximum (percent)</u>	<u>Rock type or bed from which reported</u>	<u>Minimum (percent)</u>	<u>Rock type or bed from which reported</u>
TiO ₂	1.0	Mudstone (vanadiferous zone)	none	Phosphate rock
Cr ₂ O ₃	0.8	Clay	none	Mudstone
Mn	0.6	Mudstone (vanadiferous zone)	none	Mudstone
NiO	0.3	Clay (vanadiferous zone)	none	Mudstone
MoO ₃	0.1	Mudstone (vanadiferous zone)	none	Phosphate rock
BaO	0.07	Phosphate rock	none	Mudstone
Se	0.068	Mudstone (vanadiferous zone)	0.019	Mudstone
PbO	0.05	Mudstone (vanadiferous zone)	none	Mudstone, limestone, etc.
U	0.034	Phosphate rock	none	Chert, limestone

Smaller quantities of CuO, Cl, SnO, Co₂O₃, As₂O₃, Sb₂O₃, BeO, I, Ag, Cd, B, and rare earths have also been reported. Bi, Cd, Hg, B, Li, W, Ga, Au, and Pt have never been reported, although several hundred samples have been tested spectrographically for them.

✓ Reported to me orally by D. L. King, San Francisco Chemical Company.

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10
The following table shows the number of
families in each county in which there were
more than 100 families.

⑩ 1990-1991 学年第二学期期中考试卷

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present in the phosphate minerals, for, in both size and gravimetric separations of the phosphate rock, the minor metals are concentrated in the opposite fractions from those in which the phosphate minerals are concentrated. Uranium, on the other hand, is apparently in or otherwise tied to the phosphate minerals. This will be discussed more fully later.

Rock types

Rocks of the Phosphoria formation consist of mixtures of three types of materials: chemical sediments (dominantly phosphate, calcite, dolomite, and chert, but locally including minor amounts of pyrite or marcasite, gypsum and clausonite); detritus (chiefly quartz, clay, mica, feldspar); and attritus (i.e. organic matter). Those three types of materials might be envisioned as occupying the corners on a ternary diagram, on which points representing the composition of most Phosphoria rocks would be scattered over the interior of the diagram and few, if any, would fall at the corners. In southeastern Idaho and adjacent areas most of these materials are of silt- or clay-size, though elsewhere in the field (platform facies), sand-sized particles are abundant, especially in the non-phosphatic portions of the formation. Some of the chemical particles, especially the phosphates, are structurally aggregated into colites, pisoliths, or nodules which give the rocks a coarse-textured appearance.

For purposes of classification, organic matter, which is difficult to evaluate quantitatively in the laboratory, much less in the field, is

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the first time since 1945, the average number of days between
the beginning and end of the year's campaign was 100, which
is the same as last year, but much higher than most other years.
The 12th campaign, which ended on January 1st, included an
average duration of 100 days, which is only 10 days less than
the 11th campaign.

1950-1962

1950-1962

While the average day length continues to increase,
yet the average (annual) day length decreases.
As winter's day length begins to decrease in the late fall
and early winter, there is a corresponding increase in the day length
of spring. This increase in day length is reflected in the
earlier and earlier dates of flowering, the development
of new growth and extension of branches. As day length
increases, there is a corresponding reduction in the rate of
leaf senescence and a decrease in the rate of reduction of tissue mass
within the plant. Thus, the rate of growth and development
of plants continues to fall as day length begins to decrease,
while the rate of growth and development begins to increase.
This is due to the fact that the reduction in day length
causes the plant to produce more and more energy, resulting in increased
photosynthesis, which results in greater production of energy available

1950-1962

for all the processes of growth and development. This is true
of all the vital processes, including the growth of the plant.

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disregarded and the sediments considered to be of two types: chemical and detrital. The rock name of the chemical sediments is derived from the name of the mineral forming more than 50 percent of the rock (or the dominant mineral if no one mineral forms more than 50 percent of the rock) and is modified by adjectives representing minerals which make up more than 20 percent of the rock. The rock name of the detrital sediments is based upon texture and qualified by adjectives in the same way as the chemical rocks. Because the differentiation of the finest-grained detrital rocks is too difficult to attempt in the field, siltstones and claystones are grouped under the general term mudstone.

Classing the rocks in this way, the Phosphoria formation contains six pure rock types: Phosphate rock, limestone, dolomite, chert, mudstone, and sandstone; 36 types composed principally of mixtures of two minerals, as phosphatic limestone, dolomitic mudstone, cherty phosphate rock, argillaceous sandstone, etc.; and 216 rock types in which three minerals each occur in amounts of more than 20 percent of the rock. Generally it is not possible to differentiate the three-mineral rock types in the field, and the breakdown presented here may seem overly theoretical. On the contrary, however, all of these types are present--many at a single locality, and it is one of the notable features of the formation that few of its rocks are composed of one material alone; most of them are mixtures of several very different types of materials.

Most of the phosphatic and argillaceous rocks are dark colored--black where fresh, but various shades of brown or gray where weathered. The carbonate rocks and the cherty rocks are dark too in many areas, especially

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in the geosynclinal facies, but elsewhere they are various shades of light gray or light brown. The phosphatic and argillaceous rocks as well as most of the interbedded carbonate rocks are not resistant to weathering. They rarely crop out, and are generally concealed by a few to more than 30 feet of soil or talus. Where exposed in trenches most of them are soft or medium hard, jointed and fractured. Most of the cherty rocks and many of the carbonate rocks and sandstones are hard and resistant to weathering and crop out in conspicuous combs or ridges.

Areal variations in thickness
and quality of the phosphate rock

The areal variations in the lithology of the Phosphoria formation are an important clue to its origin; in addition, an understanding of them is valuable in appraising known phosphate deposits and in further prospecting, both in the western field and elsewhere. Description of areal variations will be restricted to some of the variations of the phosphate rocks, not only because they are the uranium-bearing rocks, but because they are the rocks around which must center any exploitation of the minerals of the Phosphoria.

Nearly all the phosphate in the Phosphoria formation of southeastern Idaho and adjoining areas is concentrated in two zones—a lower and an upper zone—of the phosphatic shale member, and the thickest and highest-quality phosphate beds are at the base of the lower zone and the top of the upper zone (fig. 6). The lower phosphate bed is the only one mined throughout most of southeastern Idaho. In Wyoming and Utah, on the other hand, the lower phosphate bed either is not present, or is not as phosphatic as it is in southeastern Idaho, but the upper phosphate bed is

SECTION

and for whom it will transpire and as how we can and what we
will do to make ourselfs less obnoxious and a better example to others.
As regards your other point of making a better example to others
it is a very good idea. I have a few things in mind which I hope you will
like. One of the problems I have with our people is that they are
not interested in the outcome. I am not sure if this is because they don't know
what to do or if they just don't care. I think that if we can get them
interested in the outcome then they will be more willing to work hard
and help us reach our goals. Another thing I have noticed is that
the people who are most successful are those who are most
passionate about their work. If we can get our people to be
more passionate about their work then they will be more
likely to succeed.

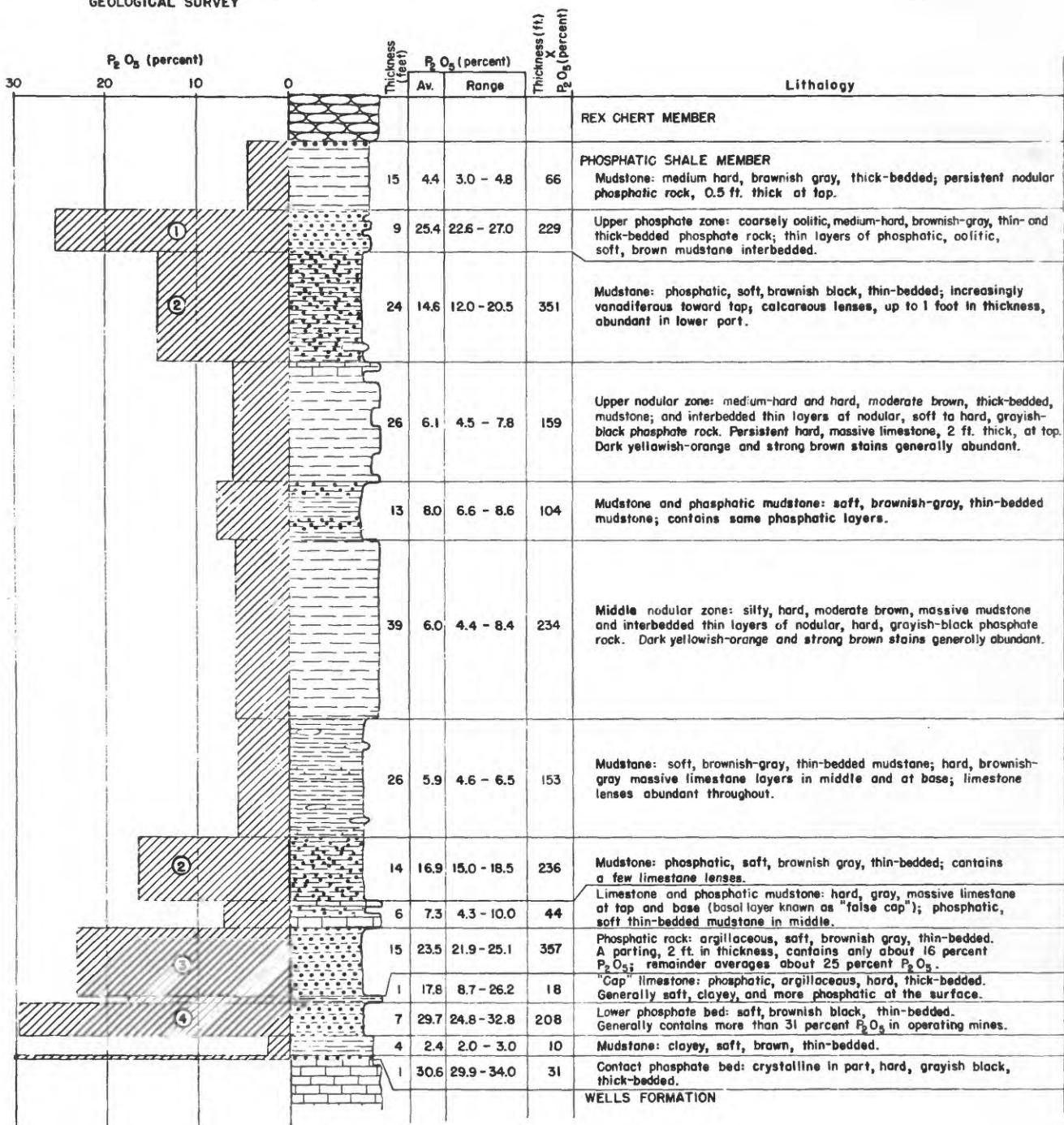
Yours,

SECTION

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Concerning your last point of making a better example to others
I think that one of the best ways to do this is to be an example to them.
If we can show them that we are capable of achieving our goals
then they will be more likely to follow in our footsteps. Another way
to be an example to others is to be a good role model. If we can
show them that we are a good role model then they will be more
likely to follow in our footsteps. Another way to be a good role
model is to be a good leader. If we can show them that we are a good
leader then they will be more likely to follow in our footsteps.

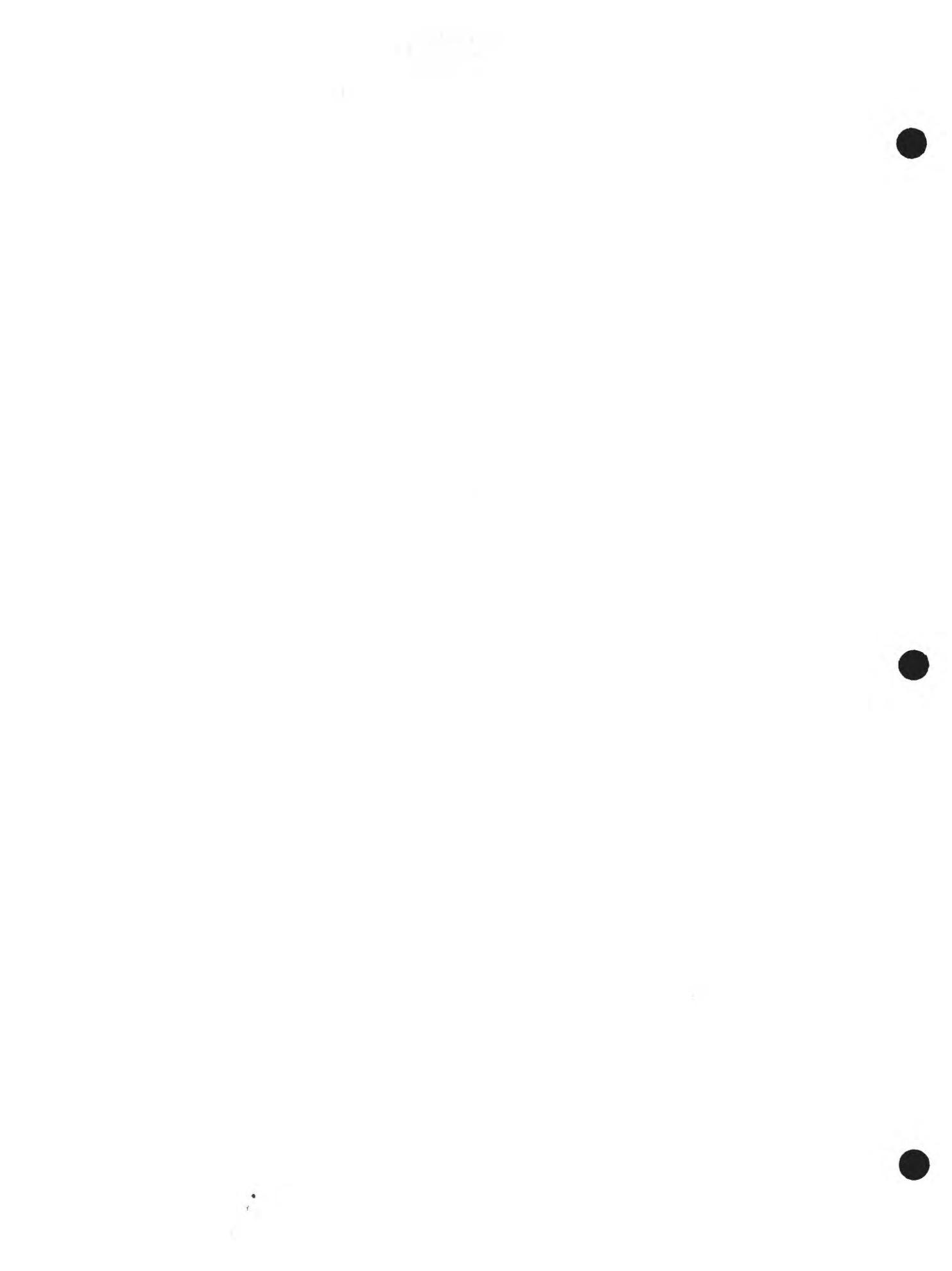
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leader then they will be more likely to follow in our footsteps.



- ① Contains 10.7 percent of total phosphate in member
- ② Contains 26.6 percent of total phosphate in member
- ③ Contains 16.2 percent of total phosphate in member
- ④ Contains 9.1 percent of total phosphate in member

GENERALIZED SECTION OF PHOSPHATIC SHALE MEMBER OF PHOSPHORIA FORMATION IN SLUG CREEK QUADRANGLE, IDAHO

Phosphate content based on analyses of samples collected from a cross-cut on the 300 level of the Conda Mine; and trenches in Trail Canyon and south Dry Valley



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of minable thickness and grade at most places in western Wyoming and northern Utah.

The middle shale member of the Park City formation, which is the Utah equivalent of the phosphatic shale member of the Phosphoria formation, contains the principal phosphatic beds in Utah. None is as thick or highly phosphatic as in southeastern Idaho, but, at least in the Wasatch Mountains east of Provo, the thickest and richest beds are also near the base and top of the member.

In the central Wyoming area, near Lander, two thin, moderately phosphatic zones are present, one near the base and the other about 100 feet below the top (King). Neither zone has ever been mined.

In Montana, phosphate is found at two principal horizons, one in Unit B, near the base of the formation, the other in Unit D, near the middle or top. As far as known, the lower zone is of commercial interest only in the Snowcrest and Centennial Ranges, where it is 4 to 6 feet thick and contains about 32 percent P_2O_5 . Elsewhere it is too thin, as in the vicinity of Dillon, or too low in phosphate content, as in the vicinity of Dell, to be mined at present; or it is absent altogether, as in the Madison Range and the Melrose, Phillipsburg, and Garrison areas. The upper phosphate bed is about 4 feet thick and contains about 32 percent P_2O_5 in the Garrison area, and where the lower members are absent, it occurs at the base of the formation, but farther south in the Melrose, Dillon, and Dell areas the phosphate is so diluted by interbedded and admixed mudstone that no thick, highly phosphatic beds are present. The upper phosphate zone is present in the Madison and Centennial Ranges, but is too thin and too low in phosphate content to

Introduction

After a decade of struggle, the country finally reached a modicum of stability, albeit at a very high cost. The economy has been transformed from one based on agriculture to one based on services, and the rural population has been reduced from 70% to 50%. The urban middle class has grown rapidly, and the gap between rich and poor has narrowed. The government has invested heavily in infrastructure, and the economy is now more diversified, with a focus on technology and innovation. The country's international profile has improved, and it is seen as a leader in sustainable development. However, there are still challenges ahead, particularly in terms of addressing income inequality and ensuring that all citizens have access to basic services. The government is committed to addressing these issues, and the people of the country are optimistic about their future.

be mined.

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The general westward increase of phosphate content is shown by a comparison of the total amount of phosphate, in terms of thickness multiplied by percent P_2O_5 , at various localities over the region (Fig. 7). Thus, in the vicinity of Lander, the total foot-percent of phosphate in the phosphatic portions of the formation is about 260, and the total increases progressively westward to about 600 foot-percent in western Wyoming, 1,400 on the Montana-Idaho border, and 2,000-2,600 in southeastern Idaho. Though a similar trend exists in Utah and Montana, at no place yet known does the formation contain as much total phosphate as it does in southeastern Idaho.

Total phosphate alone, of course, is not a reliable means of evaluating the relative quality of the deposits over the region, for a total phosphate content can be dispersed over a large thickness of rock too low in P_2O_5 content to be mineable, as it is in parts of southwestern Montana. Conversely, a relatively small total amount of phosphate, say 160 foot-percent, can be concentrated in one mineable layer, as it is in the Garrison area and Condonian Group, where virtually all the phosphate in the formation is concentrated in one mineable bed belonging to the middle and lower zones respectively. Over the remainder of the field, however, there is good correlation between the total amount of phosphate and the thicknesses of the high-grade beds. Thus, the Lander area containing no high-grade beds at all, saw the grade increase westward to southeastern Idaho where 11 to 19 feet of beds contain 31 percent or more P_2O_5 (Fig. 8), as it is true with beds of lower phosphate content. In the Lander area, about 3 feet of beds contain more than 25 percent P_2O_5 , and in southeastern

Contenidos

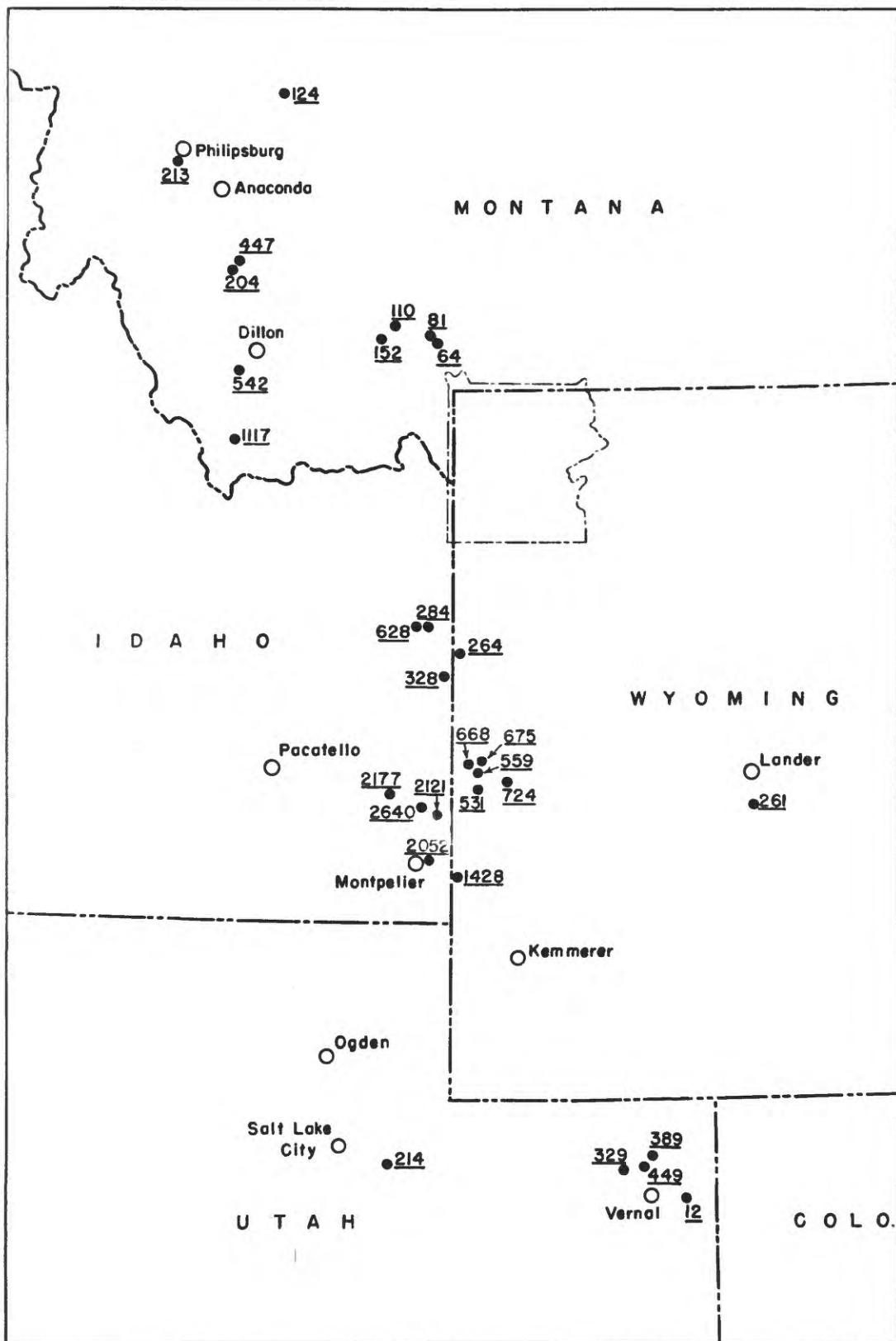
En este número de *Contenidos* se presentan los artículos que aparecerán en el número 100 de la revista. Se incluye una breve descripción de cada uno de ellos.

En la portada de este número se publica un artículo de José Luis Martínez, director del Departamento de Estudios de la Universidad de Valencia, titulado "La crisis de la cultura europea". En él se analiza la situación actual de la cultura europea y se proponen algunas soluciones para mejorarla. El autor destaca la importancia de la cooperación entre países y la necesidad de promover la cultura como factor de desarrollo económico y social.

En el número 100 también se publica un artículo de Juan Antonio Gómez, profesor de Filosofía en la Universidad de Valencia, titulado "La ética y la política". En él se aborda la relación entre la ética y la política, y se proponen algunas ideas para mejorar la ética política en Europa.

Además, en este número se publican artículos de otros autores, como María Dolores Martínez, que habla sobre la situación actual de la cultura europea; y de José Luis Martínez, que aborda la relación entre la ética y la política.

En resumen, en este número de *Contenidos* se presentan los artículos que aparecerán en el número 100 de la revista. Se incluye una breve descripción de cada uno de ellos.



TOTAL PHOSPHATE (IN FEET X PERCENT P_2O_5) IN PHOSPHATIC
PORTION OF PHOSPHORIA FORMATION

SCALE 0 20 40 60 80 100 MILES



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Idaho, 20 to 32 feet of beds contain more than 25 percent P_2O_5 (fig. 9). Similarly, in the Lander area, only about 4 feet of beds contain more than 18 percent P_2O_5 , whereas in southeastern Idaho, 43 to 62 feet of the section contain more than that amount (fig. 10).

Though regional variations in the stratigraphy must be considered in an appraisal of the potentialities of the field, they should not be emphasized so as to overshadow one of the most important features of the Phosphoria formation, namely, the remarkable lateral continuity of individual layers in particular areas. Thus, a distinctive phosphate bed at the very base of the phosphatic shale member is identifiable from the Crawford Mountains of Utah to Fort Hall, Idaho--a distance of more than 100 miles--though in no place is the bed more than a few inches thick. The lower phosphate bed is mined at various localities between Montpelier and Fort Hall, and over this distance it is relatively uniform in thickness and lithology. Many similar examples of great lateral continuity of individual layers could be given.

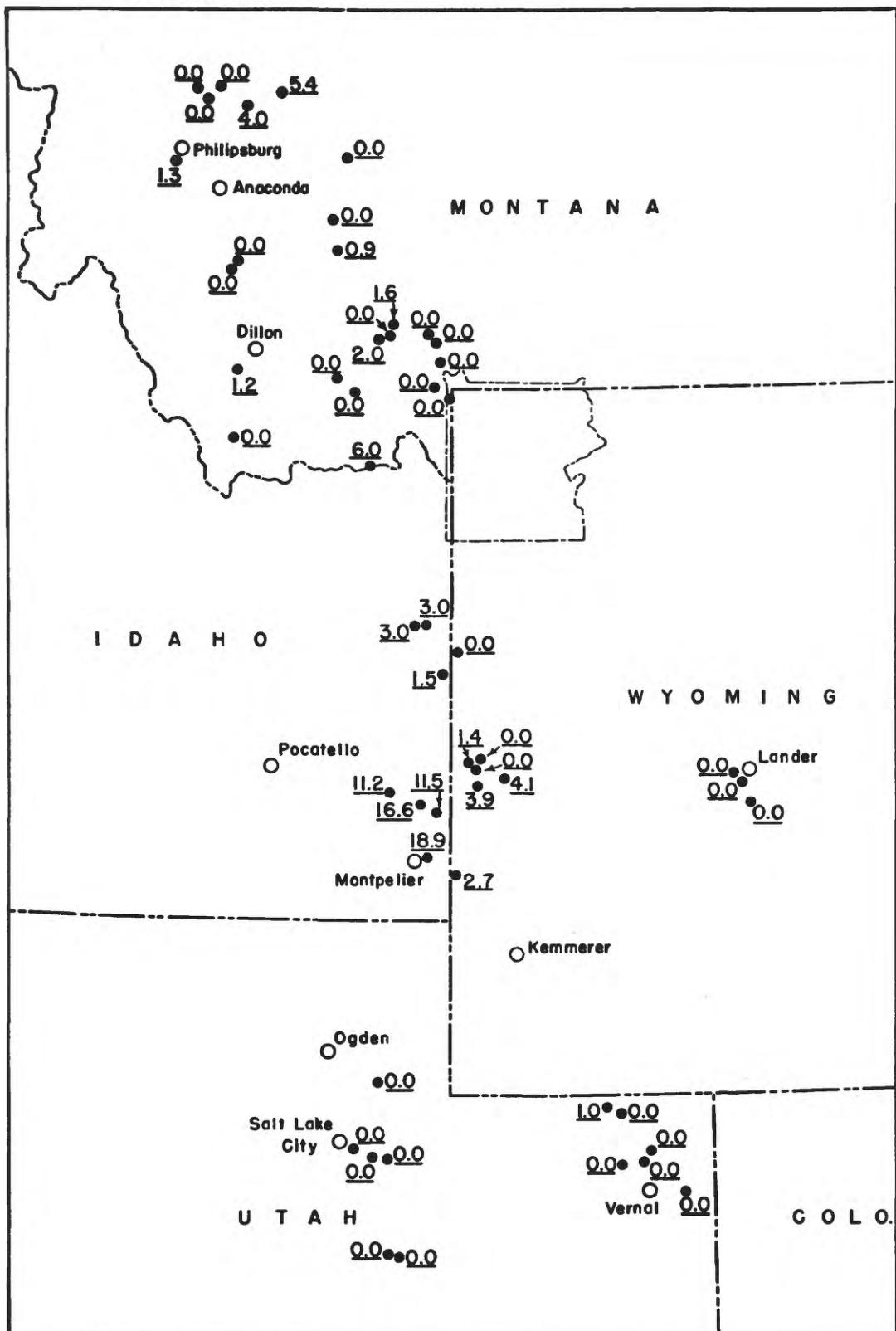
The lateral continuity of the beds is not great in the eastern and northern parts of the field, but even there it is sufficient at most places to greatly simplify evaluation of grade and tonnage of any particular layer. In contrast with most other types of mineral deposits, as few as 8 or 10 carefully cut samples are generally adequate to evaluate the phosphate content of any particular bed along an outcrop as much as a mile or two in length. A single sample, in fact, may be representative of the grade and thickness over an area of several tens of thousands of square miles, but it is not safe to depend upon it.

Origin

The origin of the Phosphoria and its minerals is by no means fully

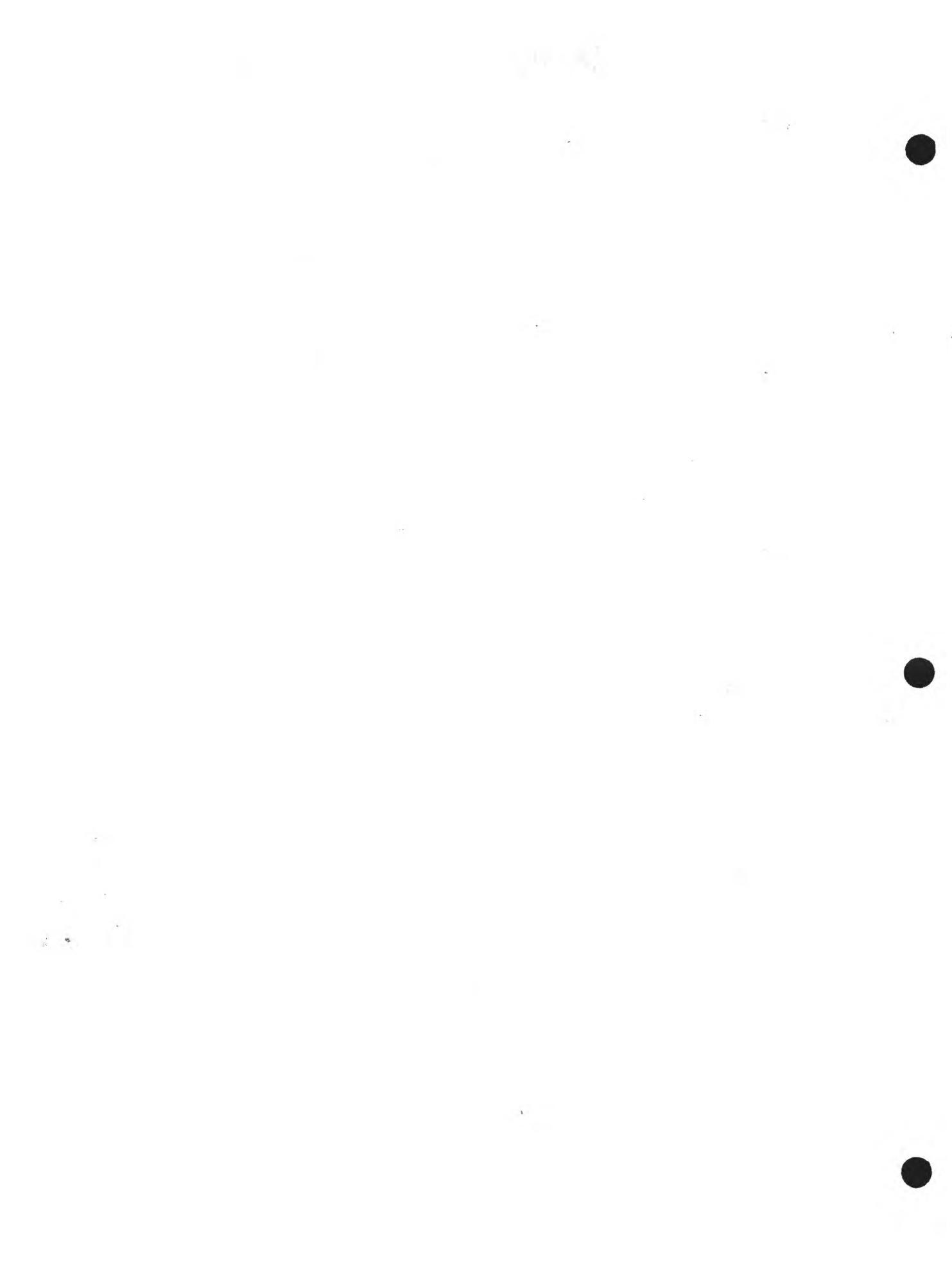
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and the first time I have seen it. It is a very large tree, and has a very large trunk. The bark is smooth and grey, and the leaves are large and green. The flowers are white and fragrant. The fruit is round and yellow. The tree is very tall and straight, and its branches spread out wide. It is a very beautiful tree, and I am sure it will grow well in our garden.



TOTAL THICKNESS (IN FEET) OF ROCKS IN PHOSPHORIA
FORMATION CONTAINING MORE THAN 31 PERCENT P_2O_5

SCALE 0 20 40 60 80 100 MILES



understood and, moreover, space does not permit full elucidation of such data and arguments as are pertinent to the problem. The following discussion is therefore merely a summary of views currently held by those working on the problem. Previous views are summarized ably by Mansfield (pp. 187-198, 1927; pp. 663-677, 1940a) and Farlow (pp. 151-164, 172-176, 1927).

Paleogeographic setting

The geography of the Northwestern States during Permian time is not known in detail, but the principal elements were: a) a low-lying land area to the east, bordering the Permian sea in central Montana, central Wyoming, and western Colorado; b) the shelf of the Permian sea, extending as far west as western Montana, western Wyoming, and central Utah; c) the miogeosynclinal basin, extending to eastern Nevada and central Idaho and separated in places (at least as far north as central Nevada) from the eugeosynclinal basin to the west by a geanticline (Nolan, 1940; Hardley, p. 315). A volcanic archipelago lay to the west, its eastern edge not far from the present eastern shore of the Pacific (Hardley, p. 311).

Although the phosphate deposits are restricted to an area of about 150,000 square miles, the Phosphoria sea was not a restricted or isolated body, but a part of the large Permian sea that covered much of the Cordilleran area. The principal marine facies correlative or at least partly correlative with the Phosphoria in the northwest are chemical sediments (carbonate and chert), clean quartz sandstone, and volcanic flows and pyroclastic rocks in the eugeosynclinal area of western Idaho, northern Nevada, and Oregon. It is noteworthy that thick sections of detritus, particularly of the gray-wacke type, are sheeted, not only in the region of Phosphoria facies, but in

"The most valuable thing about" personal finance courses "is that you learn how to manage your money and not waste it," says a student at the University of Michigan. "It's good to know how to budget and save money."

Other students say they learned how to invest money, how to buy a car, and how to pay taxes.

But the most important lesson may be that personal finance classes can help students learn how to live within their means.

According to the National Foundation for Credit Counseling, nearly half of all Americans have less than \$10,000 in savings.

And many experts say that saving money is a good idea because it can help you avoid debt and financial problems later on.

So if you're thinking about taking a personal finance class, consider these tips from experts on how to make the most of your learning experience.

First, choose a class that focuses on basic financial concepts such as budgeting, saving, and investing.

Second, look for a teacher who has experience in the field and can provide practical advice on how to apply what you've learned to real-life situations.

Third, ask questions and participate in class discussions to get the most out of your learning experience.

Finally, remember that personal finance is a lifelong process, so keep learning and adapting to changes in your life.

With these tips in mind, you'll be well on your way to becoming a financial expert.

And if you ever need help, don't hesitate to seek out a professional financial advisor or counselor.

After all, personal finance is a skill that can benefit you for a lifetime.

So if you're interested in learning more about personal finance, consider taking a class or seeking out a professional advisor.

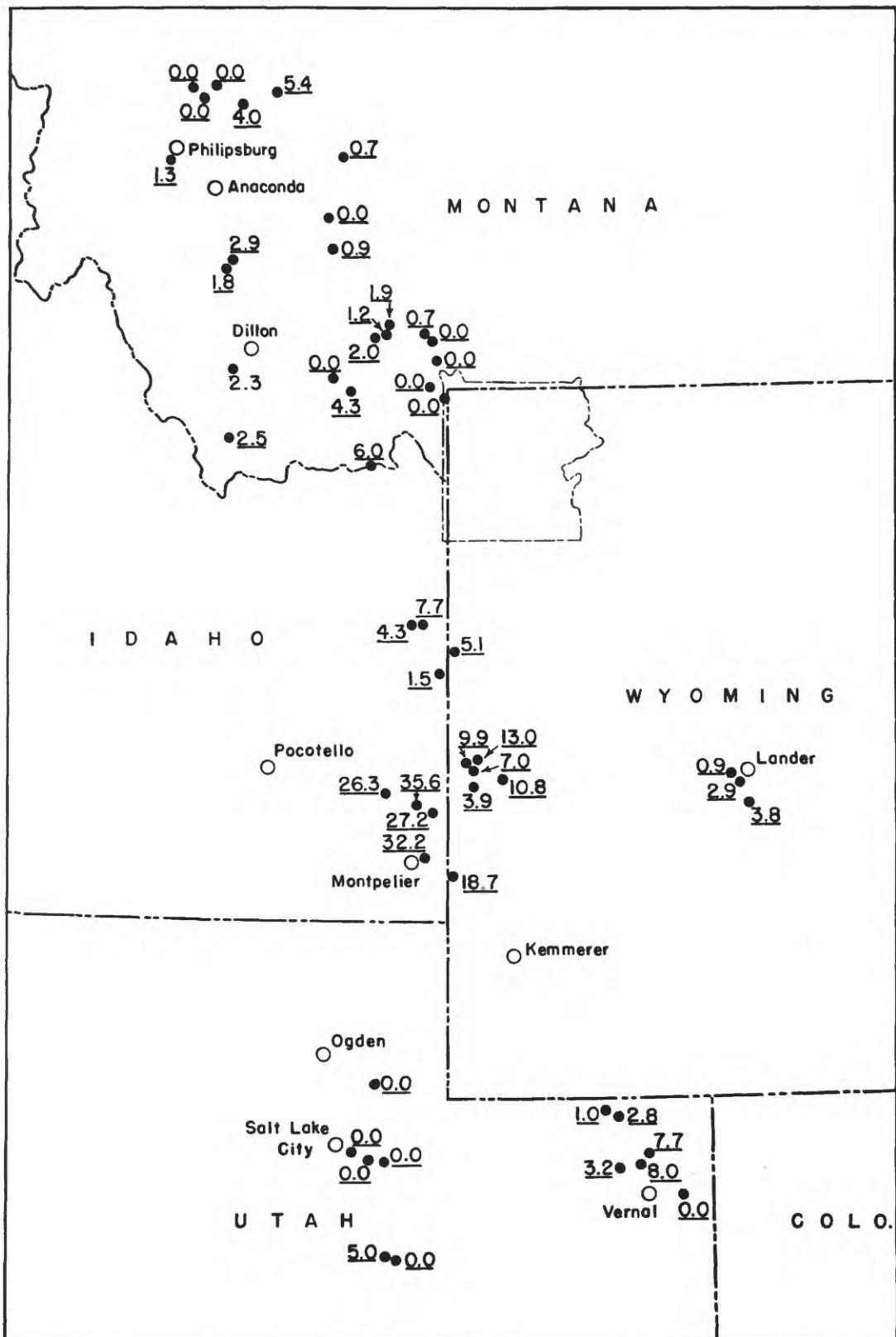
And remember, the most valuable thing about personal finance is that it can help you live a better life.

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And remember, the most valuable thing about personal finance is that it can help you live a better life.



TOTAL THICKNESS (IN FEET) OF ROCKS IN PHOSPHORIA
FORMATION CONTAINING MORE THAN 25 PERCENT P_2O_5

SCALE 0 20 40 60 80 100 MILES



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adjacent areas as well.

The depth of the Phosphoria sea increased westward, as is shown by the westward decrease in grain size of the clastics. How deep the sea may have been at the edge of the shelf is not known, but the bottom there was at least below wave base, for ripple marks, cross-laminations, and other wave marks are lacking there; moreover, the large amount of organic matter in the sediments in western Wyoming and southeastern Idaho could hardly have been preserved under oxidizing conditions which certainly would have prevailed in a shallow sea of such wide extent. Even though the sea floor must have sloped gently westward, it must have been essentially flat in any given area, for individual layers are traceable over long distances and no unconformities have ever been recognized on physical evidence, either within the formation or at its base or top.

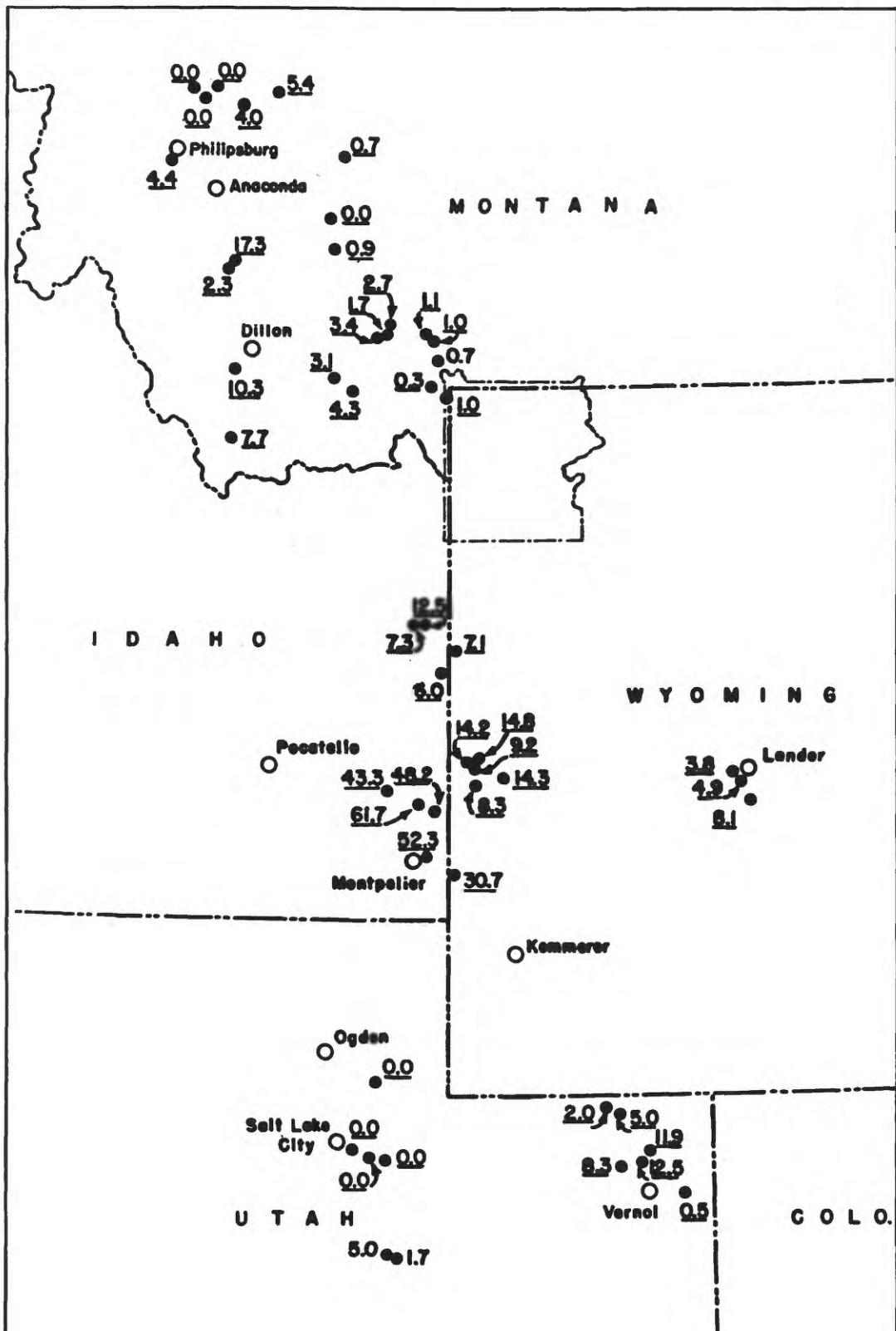
Time of deposition of the phosphate
and minor elements

The deposition of the phosphate and minor elements coincided with the deposition of the matrix of the containing beds. This has never been questioned by those who have seen the rocks in the field, but, lest there be some skeptics who would be inclined to attribute the trace elements to replacement by later percolating solutions, a repetition of the evidence proving syngenetic origin seems justified.

1. Thin layers of various lithologic types and composition persist over areas of several square miles, and some layers, containing relatively uniform amounts of phosphate, vanadium, or other constitu-

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(see also)



TOTAL THICKNESS (IN FEET) OF ROCKS IN PHOSPHORIA AND PARK CITY FORMATIONS CONTAINING MORE THAN 18 PERCENT P_2O_5

SCALE 0 20 40 60 80 100 MILES



Conclusion

ents, persist over areas of thousands of square miles.

2. Thin layers of markedly different composition, both in major and minor constituents, are interstratified.

3. Rocks which contain phosphate, vanadium, and uranium, and other trace elements are as diverse in texture, permeability, porosity, and composition as those which contain none of these constituents.

4. The mineral particles are very fine-grained.

Source of the Phosphoria sediments

Except for the detritus, which probably was derived from low-lying lands to the east, most of the elements in the Phosphoria formation were derived from the Phosphoria sea. All of the elements thus far reported from the Phosphoria formation, except antimony, are found in sea water today (Sverdrup, et. al., pp. 220, 229) and the sea is, in fact, the only "source rock" that could supply such opposing groups of elements as chromium, cobalt, and nickel, which are characteristic of ultrabasic rocks; vanadium and titanium, which, although found in rocks of diverse compositions, are comparatively abundant only in the gabbro family; copper, which is present in other rocks, but shows a preference for the subsilicic rocks; zinc, which is also found in other rocks, but which is most abundant in those that are slightly more siliceous; and molybdenum, tin, fluorine, and rare earths, all of which are generally most abundant in highly siliceous rocks (Clark, p. 40; Sandell and Goldich, p. 188).

Phosphatic sediments are accumulating on the sea floor today (Deits, et. al.) and so are some of the other elements (Oana).

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1203

...and the author's name is also present on the back cover of the book.

• The following section will contain the results of the analysis.

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Journal, 1875-1876, and "Notes on Plants and Animals from the
Savannah River," 1876-1877, in the Library of the University of South Carolina.

Journal of Health Politics, Policy and Law, Vol. 32, No. 3, June 2007
DOI 10.1215/03616878-32-3 © 2007 by The University of Chicago

[View in PubMed](http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Search&db=pubmed&term=(%22Hypertension%22%20OR%20%22Hypertensive%22)%20AND%20((%22Cannabis%22%20OR%20%22Marijuana%22)%20AND%20(%22Treatment%22%20OR%20%22Therapy%22))&list_size=20)

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What's the best way to do this? If you have any ideas, please let me know.

then on each paper record the number of each species seen.

On the 10th of January, 1863, the author left New York for Boston, where he remained until the 13th.

and the Society for Advanced Research in Paleontology.

1000-10000 m² per year, which is about 10% of the total area of the lake.

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10. The following table shows the number of hours worked by each employee in a company.

APPLIED-LEDGER

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Although it has been suggested that the Phosphoria sea was richer in phosphate, fluorine, and possibly other elements than the sea today (Mansfield, 1940a), this postulate seems unwarranted. In fact, W. W. Rubey (unpublished investigations) has shown not only that the phosphate deposits of the Phosphoria type could accumulate from present day sea water, but that the Phosphoria sea was probably not much different in composition, with respect at least to phosphate content, CO_2 , and pH, from that of the present day.

Factors leading to the concentration
of phosphate and minor elements

The abnormally small deposition of carbonate and detritus was probably the most important factor in the concentration of the phosphate and minor elements of the Phosphoria formation. The Phosphoria is the product of deposition of half and possibly most of Permian time--an interval that is represented by several thousand feet of sediments in Texas and western Nevada--and yet is only 200 to 500 feet thick over most of the area. The notion that at least the phosphate was concentrated through slight or nondeposition of other constituents receives some support from occurrences in other rocks, where it is associated with unconformities and periods of nondeposition (Goldman; Pettijohn).

Absence of diluting carbonate and detritus is by no means the only factor affecting concentration of the phosphate and trace elements. As previously described, the total phosphate content of the formation increases westward, as the thickness of the formation increases, at least as far west as southeastern Idaho; evidently, therefore, other factors

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beyond mere nondisposition of other constituents control the deposition of phosphate in one area and its nondisposition in another.

Kazakov (1937) and later more detailed investigations by Rubey (unpublished) have shown that precipitation of phosphate from the sea water is related primarily to the CO_2 content, pH, temperature, and pressure. By and large, the ocean is nearly saturated with phosphate (Distz, Emery, and Shephard), but the phosphate content varies with depth, as does the temperature, partial pressure of CO_2 , and pH. The following table is quoted from Kazakov (p. 111) and is based on conditions in the South Atlantic and the tropics.

Table 2

Depth, in meters	Temperature, centigrade	$\text{PCO}_2 \times 10^{-4}$ atm	pH	$\text{P}_2\text{O}_5 (\text{mg/m}^3)$
0-50 zone of photosynthesis	22-20	about 3	8.15	From 0 to about 50 (oscillates season- ally)
50-500	20-7	3-11 (maximum)	8.1-7.7	Increase to 300 (maximum)
500-1,500	7-4	11-4	7.7-8.0	Fall to about 200
>1,500	<4	4.0	8.0	200
near-bottom water (up to 100 m above the bottom)	about 0.5	4.8	about 7.95	A slight increase

According to Kazakov "the deep waters of the sea basins are the chief resources of phosphorus," from which it is moved "by means of deep water currents." Phosphorus, along with calcium and carbon, is supplied from the continents and, by the solvent action of deep waters rich

textbook design

textbook design. As far as I can see, there is no better way to do this than to have a single, integrated textbook for each year of school. This would mean that all the material would be contained in one book, making it easier for students to follow along and understand the concepts. It would also make it easier for teachers to teach the material, as they would have all the information they need in one place. Additionally, having a single textbook for each year would help to reduce costs, as it would be more cost-effective to print one book per year than to print multiple books for different subjects.

Conclusion

34

the first 200
classifications

}

and the last 200 classifications. This is because the first 200 classifications are the most common and easiest to learn, while the last 200 are more difficult and less common. By learning the first 200 classifications, students will be able to recognize and identify most of the common plants and animals found in their local area. This will help them to become more knowledgeable about the environment and to appreciate the importance of preserving it.

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in CO_2 , from dead animal and vegetable organisms and the bottom sediments.

According to Kazakov, phosphate is precipitated when waters rich in P and CO_2 ascend from depths to shallower water near the shore line. Precipitation is promoted by diffusion of CO_2 into surface levels poor in carbon dioxide--the phytoplankton zone--and by escape of CO_2 resulting from higher temperature and lower pressure near the surface. The escape of CO_2 causes supersaturation and precipitation first of CaCO_3 , and then of calcium phosphate. This chemical sedimentation of phosphate occurs at depths of not less than 200 meters, but intermediate between that of the zone of photosynthesis, where phosphate is assimilated by phytoplankton, and that of the deep sea where the high content of CO_2 keeps phosphate in solution. The following conditions are necessary: a) a direct connection of the shelf with the deep portions of the open ocean (not less than 200-500 m approximately); b) deep cold bottom streams ascending to the shelf as the principal source of phosphorus.

This mechanism would explain the confinement of phosphate facies to a position intermediate between the shore facies of the strand and the absence of phosphorite in continental fresh-water basins, in closed shallow sea-water basins, and in saline deposits.

Kazakov's explanation of the chemical precipitation of phosphate is, of course, incomplete, especially as it does not account for the precipitation of phosphate in the absence of the precipitation of calcium carbonate. Actually there are many phosphatic limestones, both in the Phosphoria formation and other phosphate deposits, but, as mentioned previously, the high-grade phosphates are developed only in the absence of calcium carbonate. Rubey's theoretical work has shown that there are

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conditions, however, under which phosphate, but not carbonate, will be precipitated. Nevertheless, though it is incomplete, Kazakov's theory fits the observed and previously described facts of the distribution of phosphate in the Phosphoria formation. It does not, of course, explain the precipitation of the vanadium or other minor metals, except as their solution and precipitation may also be related to the CO_2 content.

In summary, the Phosphoria formation accumulated on the shelf of the Cordilleran sea during a long period of crustal stability when the height of the adjacent lands was so low that they contributed little debris to the sea. The phosphate deposits themselves accumulated in greatest thickness near the edge of the shelf, presumably where deep, cold waters, rich in CO_2 and phosphate, ascending from the depths of the sea, became more alkaline because of a decrease in partial pressure of CO_2 and an increase in temperature.

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and the following day, the chairman called upon several senior officials
from the "T-300" organization to discuss some initial operational
problems. At this meeting, Mr. John D. Gandy, Director of Base Operations, and Mr.
William J. Kavanagh, Director of Security, both from the T-300 organization,
stated that they had been unable to find any personnel who had been
employed at the "T-300" organization prior to the organization's disbanding.
Mr. Gandy further stated that he had been unable to locate any personnel who had
been employed at the "T-300" organization prior to the organization's disbanding.
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OCCURRENCE OF URANIUM IN THE PHOSPHORIA FORMATION

Composition and mineralogy of uraniferous rocks

Nearly all rocks of the Phosphoria formation contain traces of uranium, but the most uraniferous rocks are phosphatic. The relation to phosphate is by no means a direct one, however--many highly phosphatic rocks contain little or no uranium, a few strongly uraniferous rocks (though none containing .011 or more percent U) are only weakly phosphatic, and the most uraniferous rock yet discovered (0.034 percent U; 27 percent P_2O_5) is not the most phosphatic. The relation between uranium and phosphate in the 807 samples thus far analysed for both constituents is shown graphically in figures 11, 12, and 13.

Despite the wide range in the U/P_2O_5 ratio, there is no mistaking a relationship between the two. As shown in figure 11, 50 percent of the samples containing less than 6 percent P_2O_5 contain less than 0.002 percent U; 50 percent of those containing less than about 19.5 percent P_2O_5 contain less than 0.004 percent U; and about 50 percent of those containing 27 percent P_2O_5 contain less than .009 percent U.

Significant amounts of uranium are not present in rocks containing more than a small amount of carbonate. Of 278 samples analysed for both CO_2 and U, 44 contain more than 0.005 percent uranium and only 6 of these contain more than about 2 percent carbonate CO_2 (figures 14 and 15). Of the samples containing more than 0.01 percent U none contain more than about 2 percent carbonate CO_2 .

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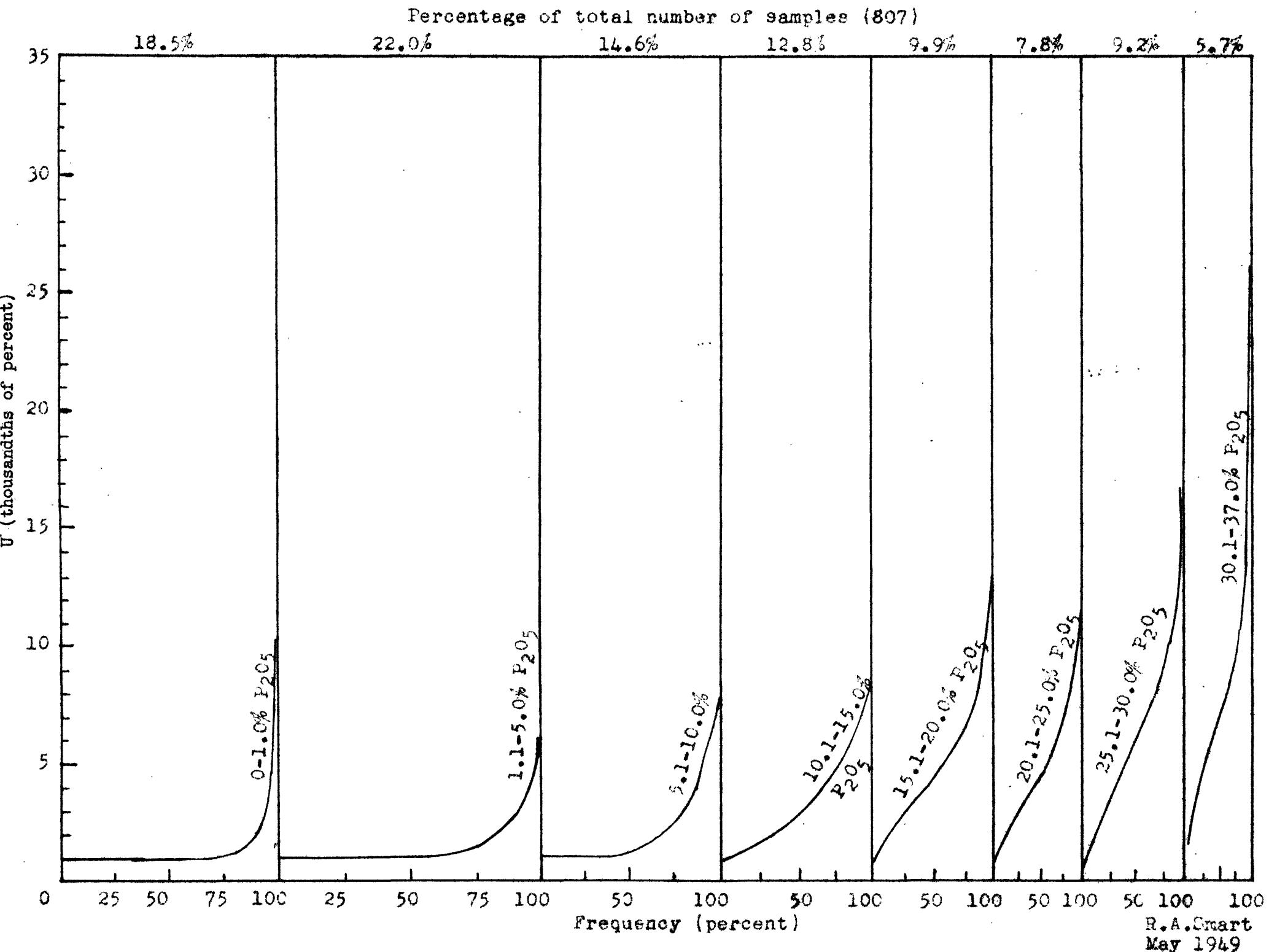
Однодневный

В это же воскресенье состоялся турнир по хоккею с мячом.
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Fig. 12



VARIATION IN URANIUM CONTENT OF ROCKS OF THE PHOSPHORIA FORMATION
CONTAINING SPECIFIED AMOUNTS OF PHOSPHATE

Example: 7.3 percent of the samples analyzed contain more than 30.0% P_2O_5 , and of these, 50 percent contain more than 0.0065% uranium

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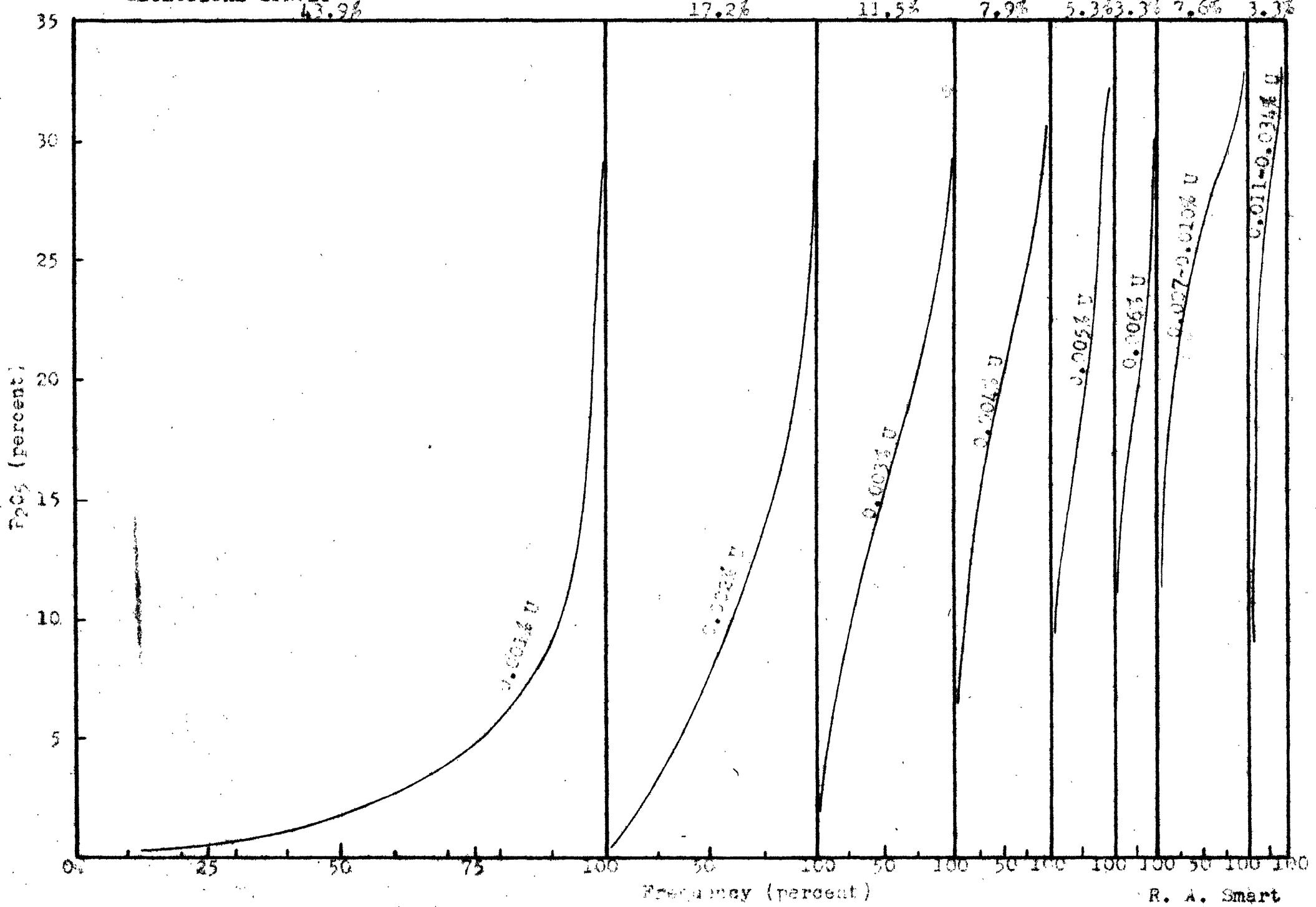


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percentage of total number of samples (307)

Fig. 13



VARIATION IN PHOSPHATE CONTENT OF ROCKS AND THE PHOSPHORIC FOSPHATE CONTAINING SOLUBLE AMOUNTS OF "URANIUM"

Example: 43.5 percent of samples analyzed contain 0.001% Uranium, and of these 88 percent contain less than 10 percent P_2O_5 .

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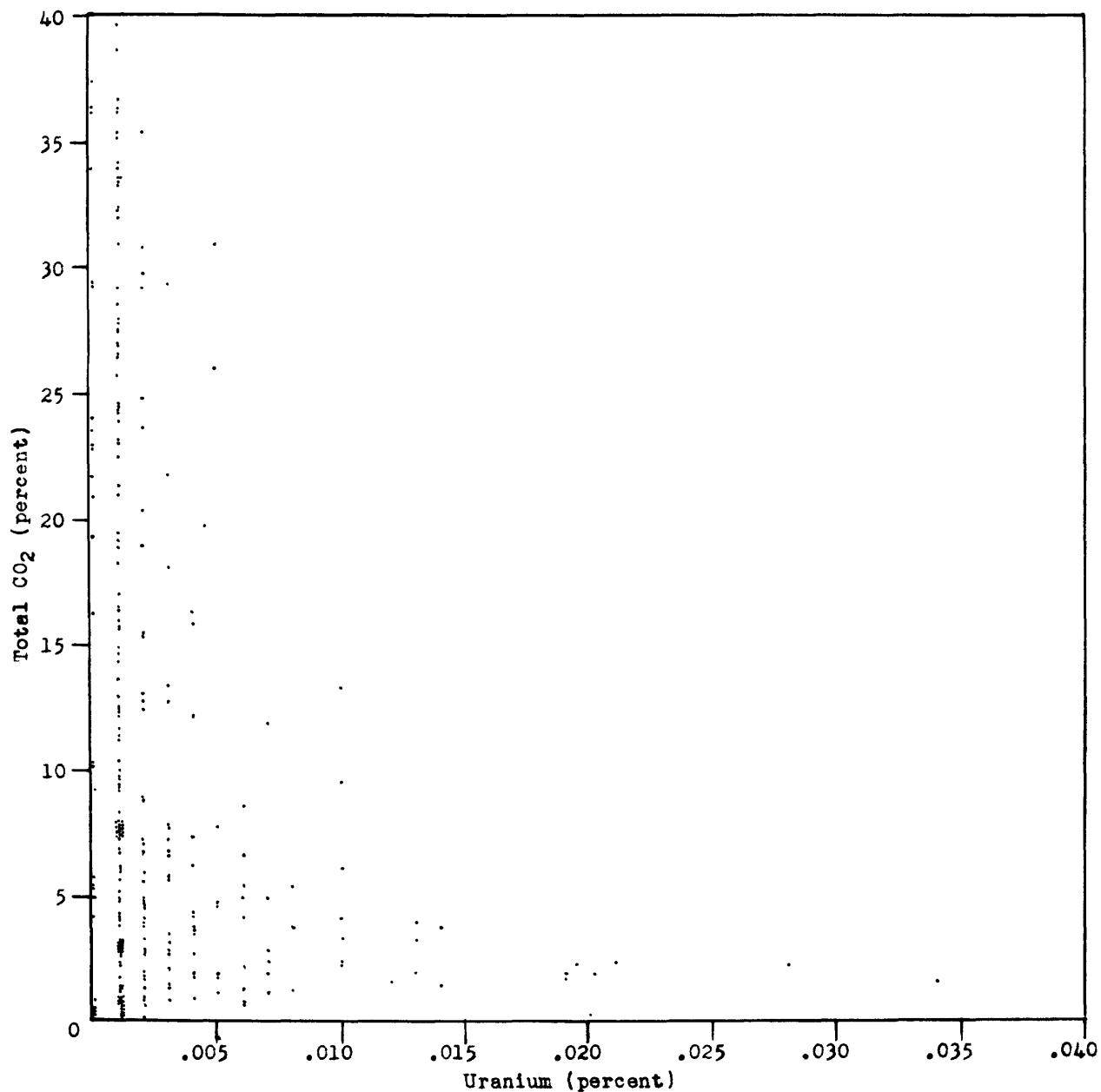
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1948

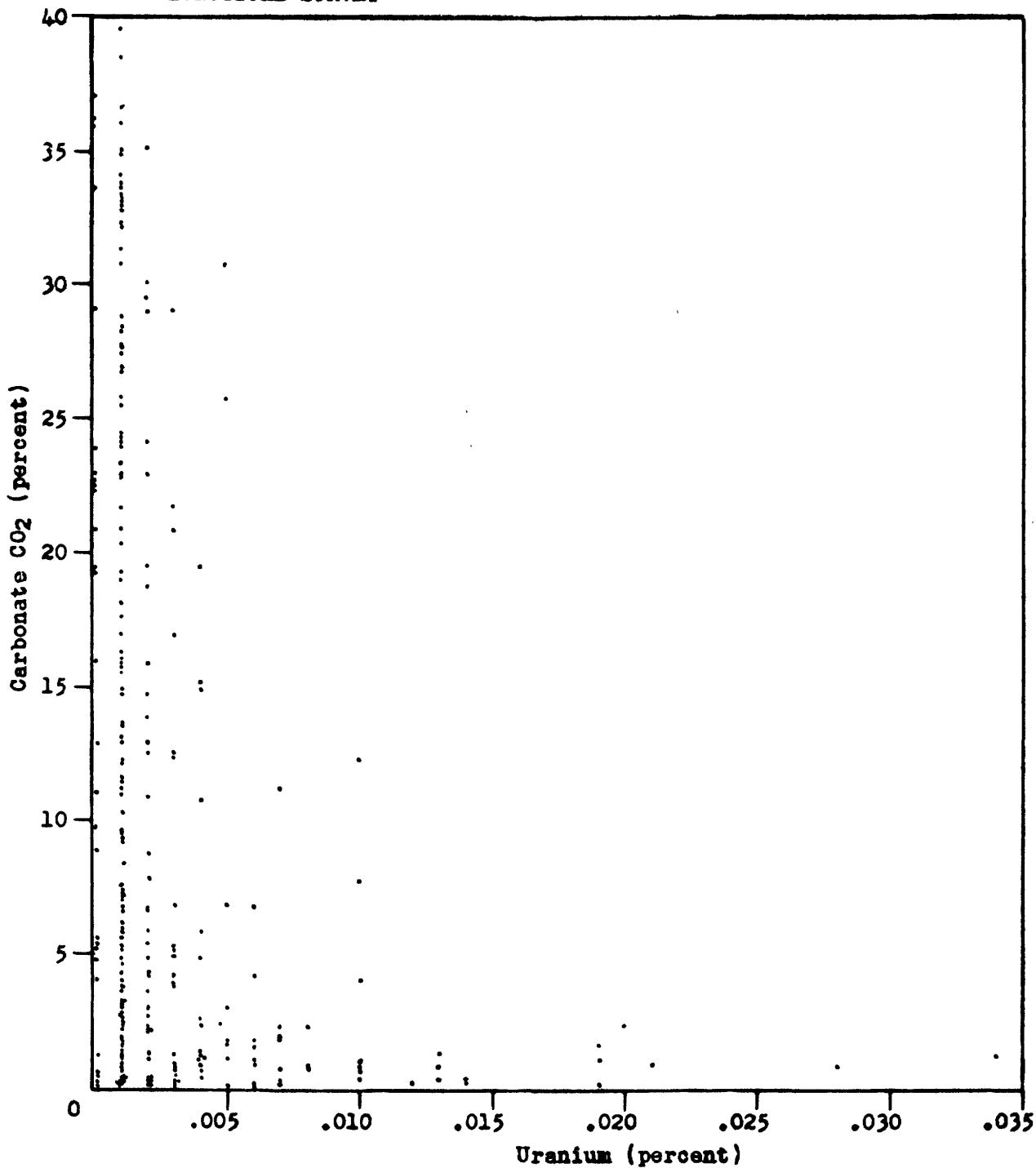
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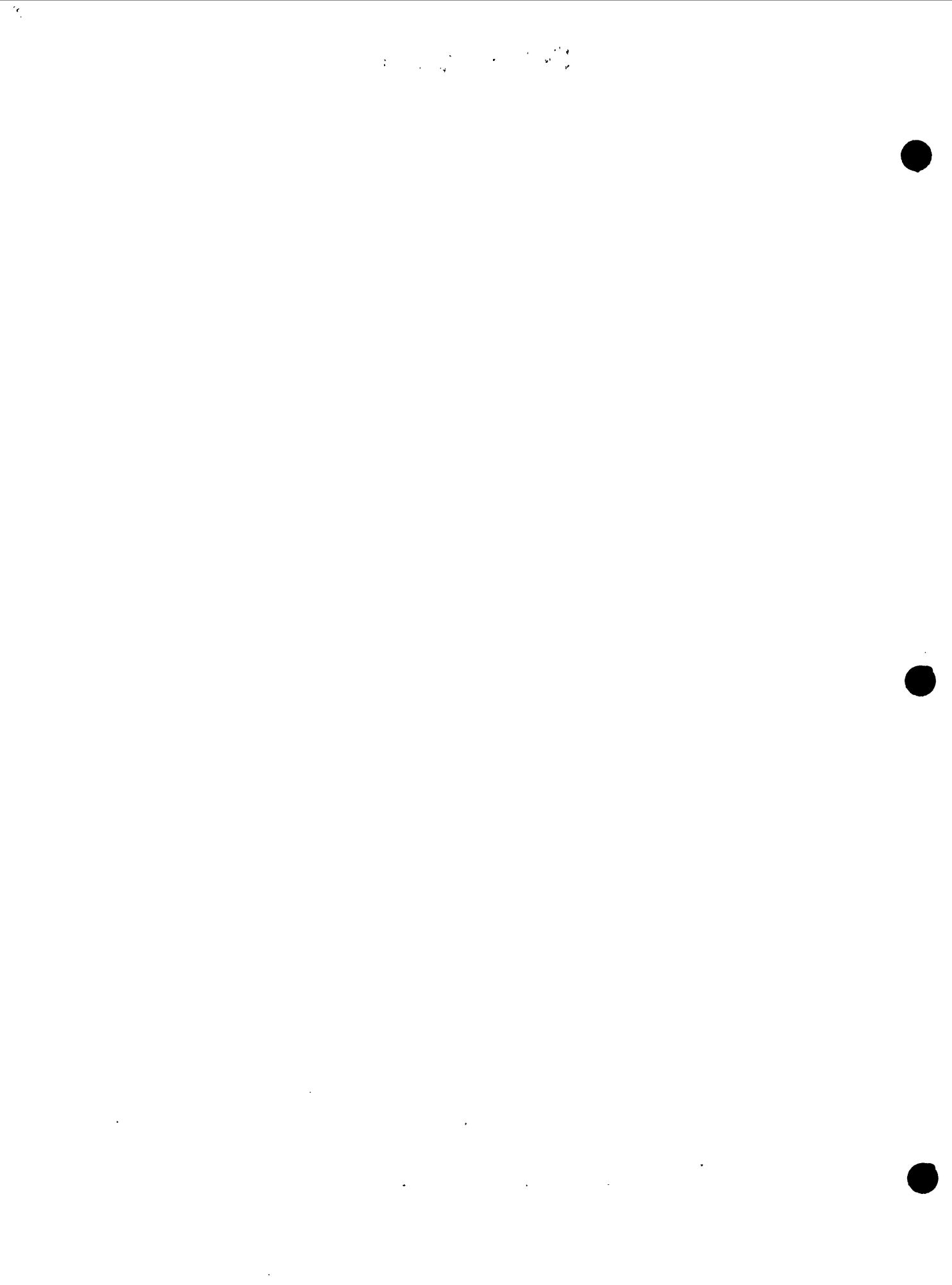
Fig. 14



Relation between uranium and total CO_2 in rocks of the phosphatic shale member at Coal Canyon, Wyoming, and Brazer Canyon, Utah.



Relation between uranium and carbonate CO₂ in rocks of the phosphatic shale member at Coal Canyon, Wyoming, and Brazer Canyon, Utah. Carbonate CO₂ has been estimated (somewhat arbitrarily perhaps) as 0.1 x %P₂O₅ - ~~#~~ total CO₂ (assuming phosphate mineral has the formula 10CaO. 3P₂O₅. CaF₂. CO₂).



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Uranium also varies inversely with acid insoluble (which may be taken as an approximate measure of the total amount of detritus in the samples) and with organic matter (as judged from loss on ignition, minus CO_2 and water). Unlike the CO_2 , however, neither the organic matter nor acid insoluble seems to have any dampening effect on the uranium (figures 16 and 17). They decrease as the uranium increases merely because high concentrations of phosphate and organic matter and detritus are mutually exclusive.

That the uranium seems to be in the phosphate mineral is shown by the previously discussed positive relationship between U and P_2O_5 and, more convincingly, by the fact that the amount of uranium dissolved on acid treatment is proportional to the amount of phosphorus dissolved. The nature of the occurrence in the fluorapatite mineral is unknown, but the wide variation in the $\text{U}/\text{P}_2\text{O}_5$ ratio shows that uranium is not an essential part of the fluorapatite mineral. More likely uranium is held by chemical adsorption (that is, uranium ions are chemically bonded to anions on the surface of the phosphate mineral) or else it proxies for calcium, which has about the same ionic radius, in the fluorapatite lattice. Either mode of occurrence is difficult to prove and both fit the observed facts of the general relationship between uranium and phosphate.

Areal variations in uranium content

In view of the general relation between uranium and phosphate, we would expect that the amount of uranium would increase westward as the phosphate increases (figs. 18 and 19). This is true, but in addition it appears also that the $\text{U}/\text{P}_2\text{O}_5$ ratio is greater in the western than in the

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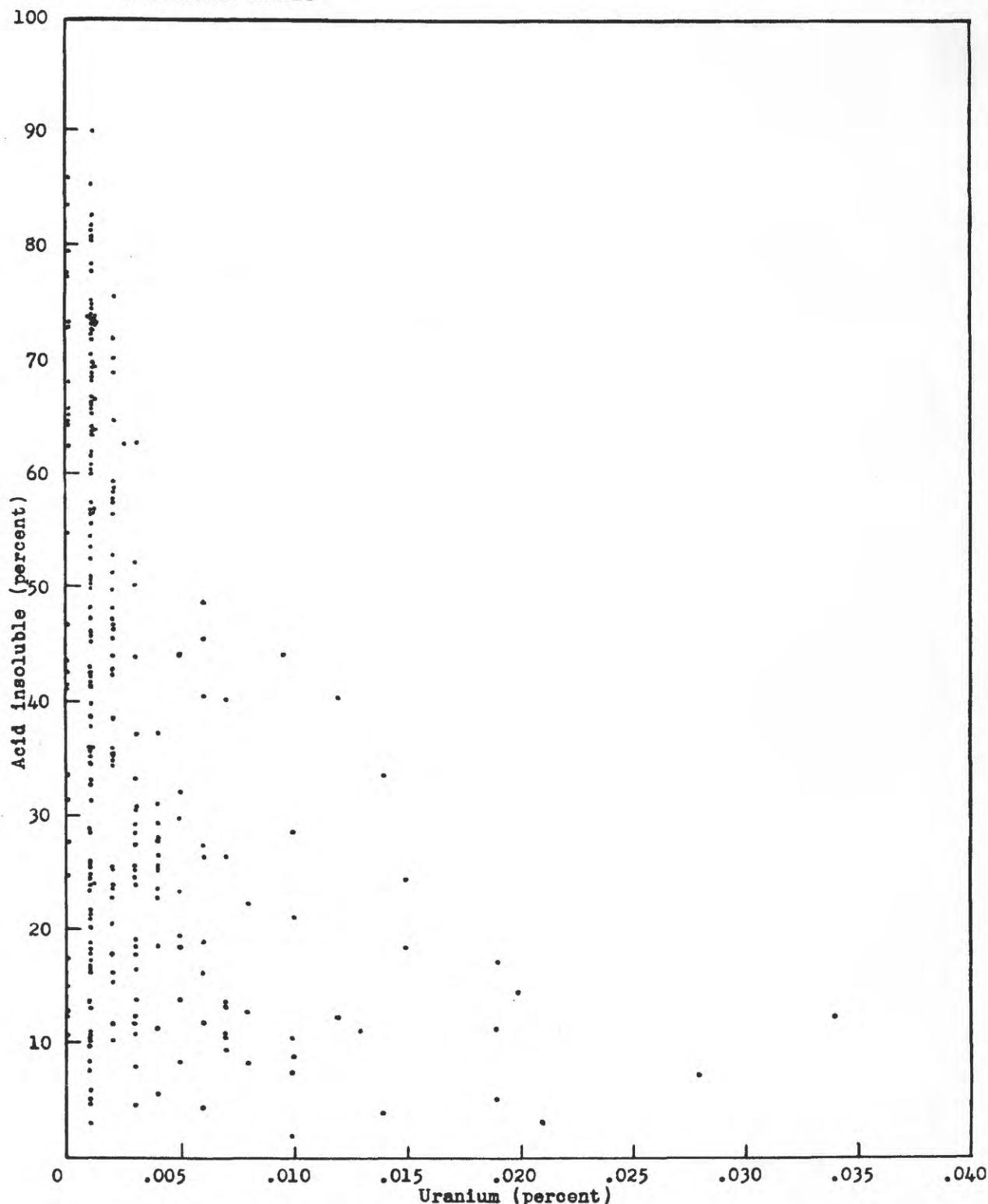
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As you know, the student loans you have received are interest-free.
You are entitled to repayment of your principal and interest at 12%
per annum (calculated daily) and such interest will accrue from the date
you receive your first loan, provided you have taken a loan of \$12,000
or more. Interest will cease to accrue on the day you make a final
payment. As a result, you will pay less interest than you would have
paid if you had taken a loan of \$12,000 and paid it off over a period
of 10 years.

If you have a loan balance of \$12,000 or more, you will be entitled to a
repayment plan which will reduce your daily rate of interest to 12%
per annum (calculated daily) and you will pay less interest than
you would have paid if you had taken a loan of \$12,000 and paid it off
over a period of 10 years. Provided that the daily rate of interest is
not reduced below the daily rate of interest which you would have
been entitled to had you taken a loan of \$12,000 and paid it off over a
period of 10 years. If you have a loan balance of \$12,000 or more,
you will be entitled to a repayment plan which will reduce your
daily rate of interest to 12% per annum (calculated daily) and you will
pay less interest than you would have paid if you had taken a loan of
\$12,000 and paid it off over a period of 10 years. If you have a loan
balance of \$12,000 or more, you will be entitled to a repayment plan
which will reduce your daily rate of interest to 12% per annum (calculated
daily) and you will pay less interest than you would have paid if you had
taken a loan of \$12,000 and paid it off over a period of 10 years.

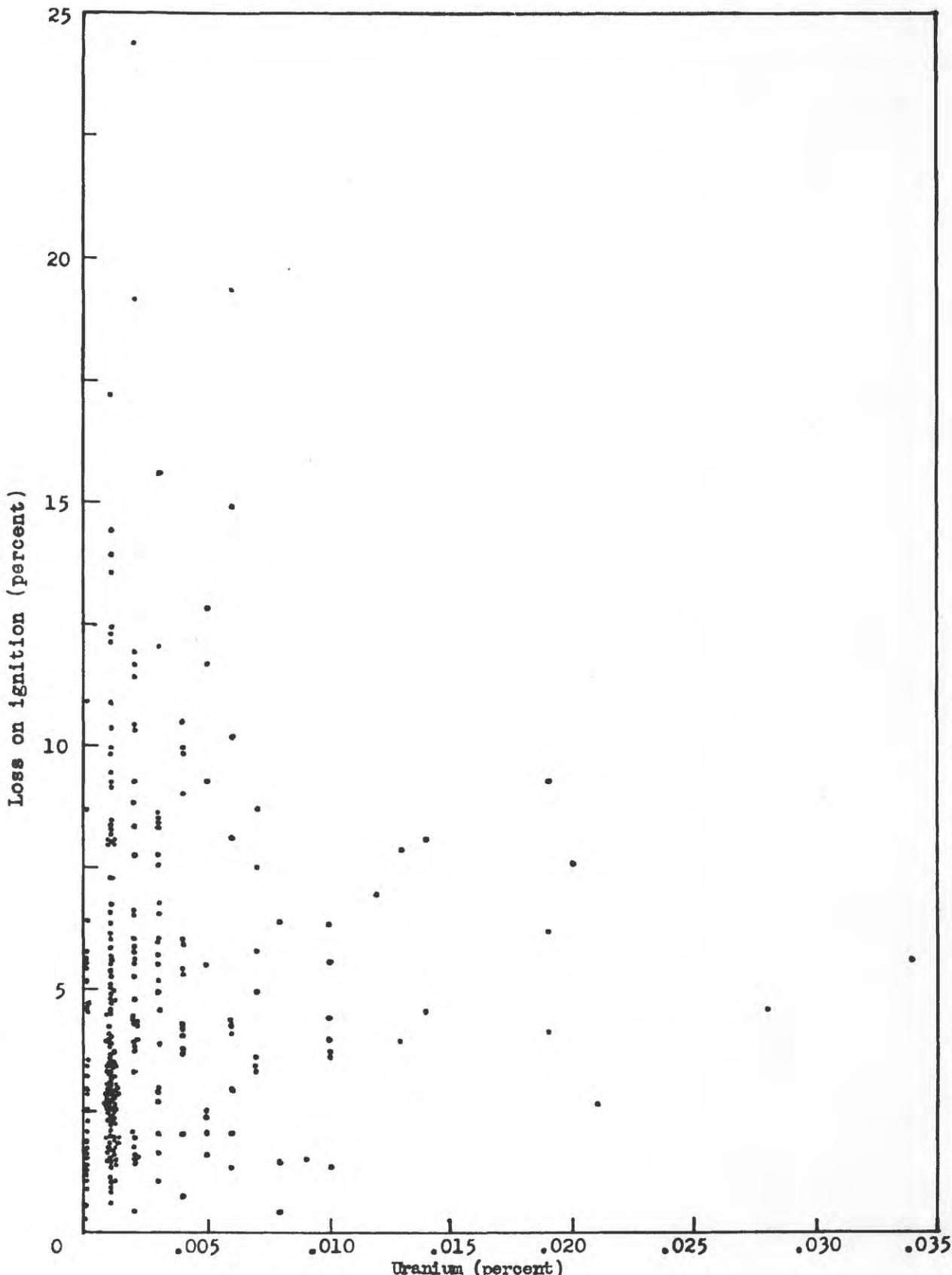
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I hope that all your friends and family members will be able to
help you to repay your loan. If you have any questions about your
loan, please do not hesitate to contact us. We are here to help you
and we want you to be successful in your studies and to graduate
from our program with a degree that will help you to succeed in
your chosen field of study.

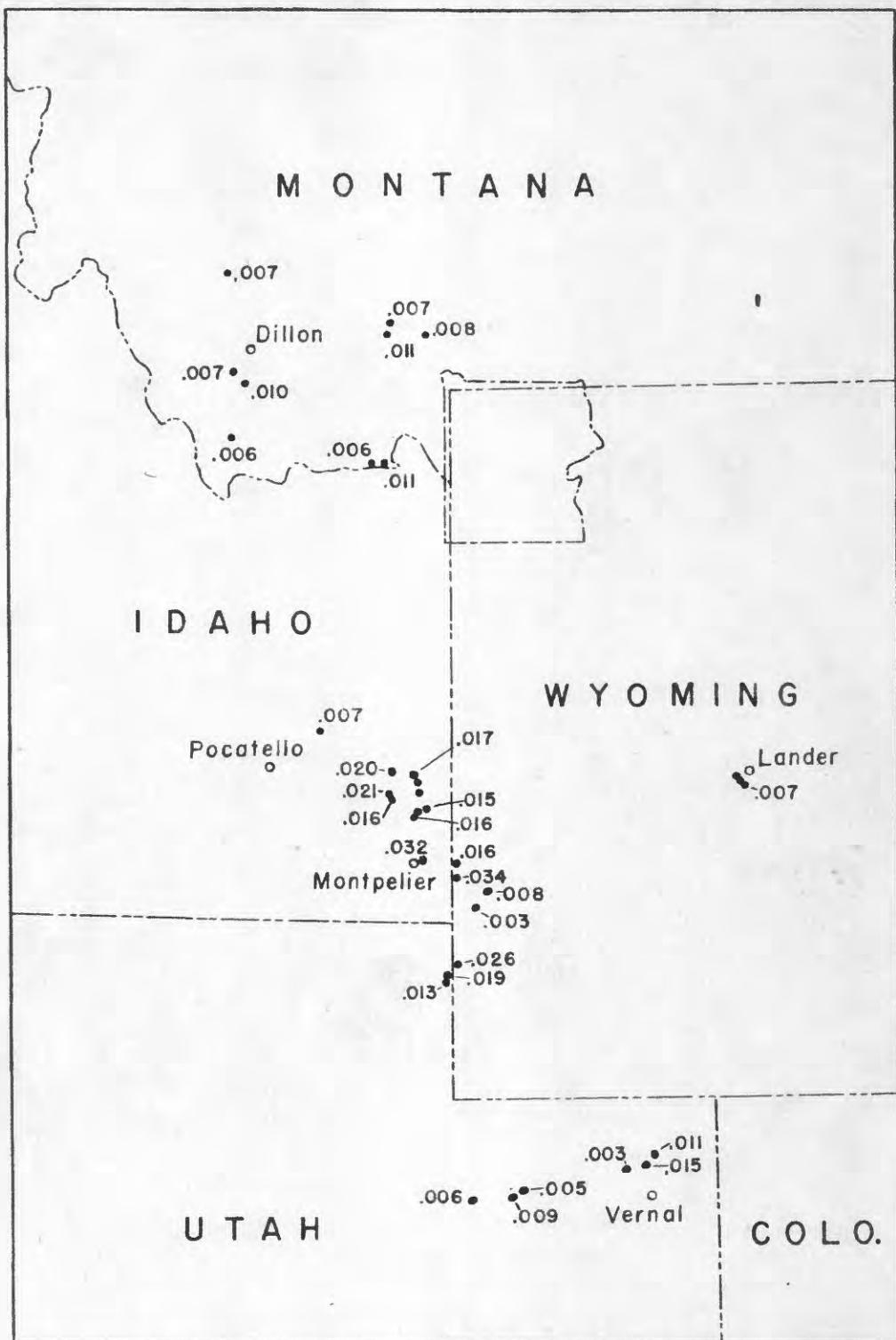


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MAXIMUM URANIUM CONTENT (PERCENT) THUS FAR REPORTED FROM THE
PHOSPHORIA FORMATION AND ITS CLOSE STRATIGRAPHIC EQUIVALENTS

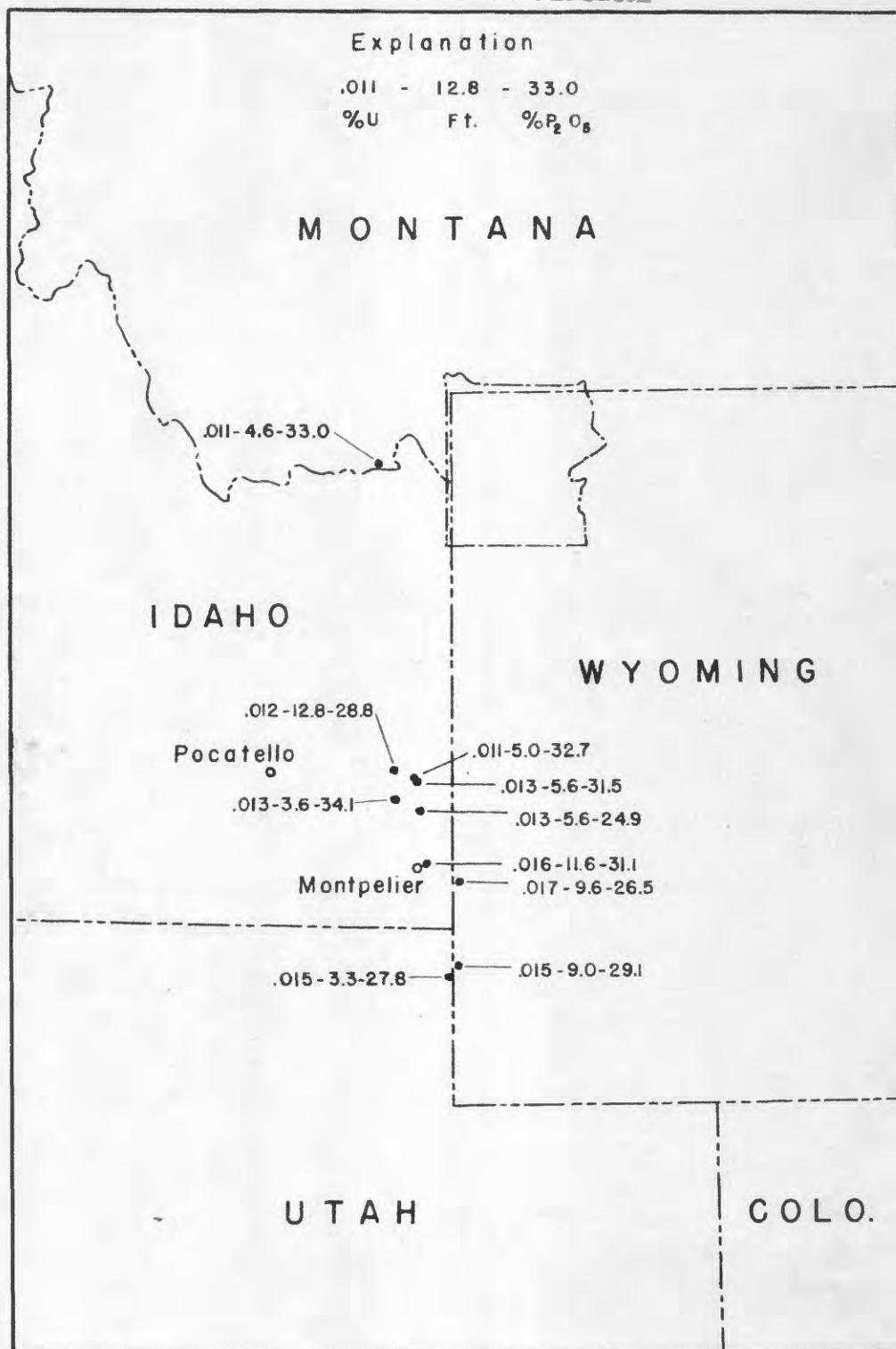
SCALE IN MILES
20 0 20 40 60 80

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Figure 19



TOTAL THICKNESS, U, AND P₂O₅ CONTENT OF BEDS CONTAINING
0.01 PERCENT OR MORE U IN UNITS OF 3 OR MORE FEET IN THE
PHOSPHORIA FORMATION AND ITS CLOSE STRATIGRAPHIC EQUIVALENTS

SCALE IN MILES

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eastern part of the field. The data on which this generalization is based are very scant indeed. The trend, however, is illustrated by the following comparison of the U/P₂O₅ ratio in beds containing 20-25 percent P₂O₅ at specific localities (left to right = west to east).

Table 3

Average U/P₂O₅ ratio in beds containing 20-25 percent P₂O₅

Montpelier Canyon, Idaho	Coal Canyon, Wyoming	Near Vernal, Utah (3 localities)	Near Lander, Wyoming (10 localities)
0.00040	0.00018	0.00016	0.00010

Enough data are not yet available to show much about the local variation of uranium in specific beds. It appears that some, at least, are as uniform in their uranium content as are the phosphate beds themselves, but that the uranium content of other beds varies in ways not anticipated from the phosphate content. Thus, the lower phosphate bed in Caribou and Bear Lake Counties in southeastern Idaho contains an average of about 0.009 or 0.010 percent uranium and about 32 percent P₂O₅, but at the Simplot phosphate mine at Fort Hall the uranium content of the same bed is only about 0.006, though the phosphate content is about the same.

The vertical distribution of uranium within the section closely corresponds to that of the phosphate. It is noteworthy that, despite the wide variation in the U/P₂O₅ ratio, the most uraniferous beds are in the minable phosphate units. In southeastern Idaho and adjacent parts

Comments

and the last sentence is on page 107, words 30-31, and the first sentence on page 108, words 1-2, both quoted from the same speech.

— 10 —

1993-1994
1994-1995
1995-1996

CHOCOLATE

During the 1990s, the number of educational institutions increased from 1,000 to 1,600, and the number of students increased from 100,000 to 150,000.

From 1976 to 1980, the following organizations took part in the "National Conference on the Environment":

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of Wyoming and Utah, these beds lie near the base and top of the phosphatic shale member (fig. 20).

Origin

The uranium in the phosphates of the Phosphoria formation is of syngenetic origin. It seems certain that the immediate source of the uranium, like that of the phosphate and other minor elements, was the sea water, which now contains about 0.000002 grams per liter (Foyn, et. al.). The manner of its transportation and precipitation, however, are unknown, but the data available make possible some speculations which may be helpful in the search for other deposits.

The solubility products of the various uranium compounds that might be dissolved in sea water are unknown, but, judging from the water solubility of uranyl sulphate, phosphate, and especially carbonate (Dement and Dake, p. 100), together with the fact that the amount of uranium dissolved in the sea is small, it seems probable that their solubility products in the sea are higher than their ionic products and that the sea is therefore not saturated with uranium salts. If the sea were saturated with uranium salts, significant concentrations would be expected in sediments which accumulate slowly—not only in sediments like the marine phosphates and black shales, which do contain uranium, but also in the sediments of the deep sea. The deep sea sediments tested for uranium, however, contain only about 0.0005 to 0.001 percent uranium—an amount not nearly sufficient to account for their radium content (Urry, p. 203). In fact, Pigget and Urry (p. 85) have been led to the conclusion that "the ocean is a reservoir for most of the uranium

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and the other two were also present. The last group of three was the same as the first.

1994-05-20 10:00:00 - 1994-05-20 10:00:00

1. *Chlorophytum comosum* (L.) Willd. (Asparagaceae)

Quản lý chất lượng của một trang web là việc kiểm tra và xác minh

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Gombergs

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that is poured into it, while the ocean bottom is the repository for the transient radium." Both Goldschmidt (see also Sverdrup et. al. pp. 220-222) and Russell (p. 1483) have shown, on the other hand, that most of the uranium that could have been brought to the sea during all of geologic time is in the sediments rather than the sea water. It seems likely, however, that the uranium removed from the sea has been removed selectively, rather than by direct inorganic precipitation from a saturated solution.

Selective removal of uranium salts might have been brought about by organisms, or by various types of adsorption. Little is known about the part organisms might have played in the precipitation of uranium. The uranium content of marine organisms has not been determined, but some animals remove uranium from the bloodstream and concentrate it in body tissue and bone (Newman). Although marine organisms in great variety concentrate radium, Pigget and Urry (p. 83) doubt that this process explains the concentration of radium in the surface of the deep-sea sediments, because the animals extract only a small part of the radium from their environment, and "their remains mostly dissolve before reaching any profound depth." Even less is known about the role of marine organisms in concentrating uranium. Its concentration in phosphatic beds of the Phosphoria formation, rather than in beds rich in organic matter, make it doubtful, however, that organisms played a major role in the concentration of uranium there.

Several workers have suggested that uranium may be adsorbed by clay, organic matter, or other finely divided material (Beers and Goodman, p. 1251; Hoogteijling and Sisoo; Tolmachev; and Frederickson), and it seems likely that uranium may also be adsorbed by phosphates. Adsorption is

1994-1995
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the attraction of a foreign body to the surface of a given substance. Two general kinds have been recognized (Prutton and Marion, p. 232; Mantell, p. 3): (1) physical, or van der Waals adsorption, and (2) chemical adsorption. Physical adsorption is characterized by a loose bonding of the adsorbate to the adsorbent; it is probably of little importance in the concentration of uranium in phosphates, both because the amount of uranium adsorbed is apt to be very small, and because it is only loosely held. Chemical adsorption is characterized by firm bonding of the adsorbate to the adsorbent. It may involve the bonding of a foreign ion to open bonds at the surface of a substance, or it may involve the exchange or substitution of a foreign ion for an ion at the surface (even an interior one). The amount of adsorption and the selection of ions adsorbed is governed by a number of rules or laws, two of the most pertinent of which are (Hevesey and Paneth, p. 163): 1) The amount of adsorption of a given ion increases with decreasing solubility of the compound formed with the oppositely charged lattice ion; and 2) the adsorption of an ion is favored if the compound formed is isomorphous with the adsorbent and if the ion is similar in size to one of those of the crystal lattice (see Kolthoff and Sandell, pp. 103-117).

In view of the similarity in ionic radius of uranium and calcium ions; the relative insolubility of the uranium in the phosphate mineral (though the uranium in the western phosphate rock is acid soluble, it is not leached out in the course of weathering, even where weathering has been so intense that the organic matter, carbonate, vanadium, and other minor elements have been removed); as well as the strong chemical affinity that exists between uranium and phosphate (shown by the many phosphate minerals and compounds; see Dallert and Dake, pp. 134-140), it seems probable that uranium could be adsorbed from the sea water by precipitated phosphate, and that it substitutes for calcium

Современное

самые яркие и интересные моменты в жизни страны. Их можно назвать «событиями», которые произошли в 1990-х годах. Одним из самых ярких событий было создание независимой Украины. Это было историческое событие, которое изменило судьбу нашей страны. Другим важным событием было введение курса на евроизацию. Это было началом нового этапа в развитии Украины. Третьим важным событием было создание Национального банка. Это было началом нового этапа в развитии экономики Украины. Четвертым важным событием было создание Национальной гвардии. Это было началом нового этапа в развитии безопасности Украины. Пятым важным событием было создание Национальной армии. Это было началом нового этапа в развитии вооруженных сил Украины. Шестым важным событием было создание Национальной милиции. Это было началом нового этапа в развитии внутренней политики Украины. Седьмым важным событием было создание Национальной налоговой службы. Это было началом нового этапа в развитии налоговой политики Украины. Восьмым важным событием было создание Национальной таможни. Это было началом нового этапа в развитии таможенной политики Украины. Девятым важным событием было создание Национальной инспекции по труду. Это было началом нового этапа в развитии социальной политики Украины. Десятым важным событием было создание Национальной инспекции по здравоохранению. Это было началом нового этапа в развитии здравоохранения в Украине. Единственным важным событием в 1990-х годах было создание Национальной инспекции по экологии. Это было началом нового этапа в развитии экологической политики Украины.

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in the fluorapatite structure. Whatever favors the adsorption of uranium, it seems certain that the presence of carbonate ion inhibits it. Pigget and Urry (p. 89) have pointed out that in the laboratory "the precipitation of uranium is inhibited by the presence of the carbonate ion." That such a relationship exists in nature is shown by the aforementioned negative correlation between uranium and carbonate.

The theory that uranium is precipitated by adsorption in the phosphate may explain the lack of a constant uranium-phosphate ratio. The amount of uranium in the phosphate mineral may be a function of the concentration of uranium in the sea at the time of deposition of the phosphate, the relative solubility of the uranium salts, as well as the length of time the phosphate mineral particle is exposed to the uranium-bearing solution. Phosphate precipitated at times or places where the sea contained subnormal amounts of uranium would contain less uranium than it could if the sea were more uraniferous. Similarly, precipitated phosphates exposed to the sea water only a short time, either because they were quickly deposited or buried after precipitation, would contain less uranium than those mineral particles that were exposed to the sea for a long time, either because they remained in suspension for a long time after their precipitation, or because they were exposed to sea water for long periods after their deposition. If, however, the uranium salt in the sea were highly soluble, the reverse might be true; phosphates quickly precipitated and buried might contain more uranium than those long exposed to the solution.

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DISCUSSION

Throughout this study, we have seen how the concept of "disability" has changed over time and how this change has affected the way we think about disability. We have also seen how the concept of "disability" has been used to describe different groups of people, including those with physical impairments, cognitive disabilities, mental health issues, and developmental disabilities. These changes in the way we think about disability have led to significant improvements in the way we support people with disabilities, including the development of more inclusive policies and programs, and the promotion of self-determination and choice. However, there is still much work to be done to ensure that all people with disabilities are able to live full, meaningful lives. This requires continued advocacy and support for policies and programs that promote equality, inclusion, and respect for the rights and dignity of all people with disabilities.

Conclusion

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METHODS OF PROSPECTING FOR URANIUM
IN THE PHOSPHORIA FORMATION

Prospecting for uranium in the Phosphoria formation has consisted of systematic channel sampling of every lithologic unit of the phosphatic shale member of the formation, and, at some localities, the whole formation. Generally units less than 0.5 feet in thickness have been lumped together, but in some places units as thin as 0.2 feet have been sampled separately. This practice has been deemed advisable because:

1. Even with the general relationship between uranium and phosphate, there is no way of definitely predicting which beds are uraniferous and which are not, except by the use of chemical or radio-metric analyses.
2. Even though the uraniferous beds generally can be distinguished from the non-uraniferous beds in the field by use of a Geiger counter, measurements so made are not accurate quantitatively, and are no substitute for laboratory determination.
3. Uranium is a minor constituent of the rocks and if it is ever recovered, it will be as a co-product of phosphate, and possibly other minor constituents such as fluorine, vanadium, nickel, or zinc. It is therefore necessary to know the content of all the rocks that might conceivably contain constituents of commercial interest; obviously the composition of the partings that might be mined with any particular unit, or might dilute it from the walls, must be known also.

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and the other two, which were the first to be made, were
the same. The first was a small one, about 100 ft. long, and
was built of rough stones, and the second was a larger one,
about 150 ft. long, and was built of large stones, and the
third was a small one, about 50 ft. long, and was built of
large stones. The fourth was a small one, about 50 ft. long,
and was built of rough stones, and the fifth was a large one,
about 150 ft. long, and was built of large stones, and the
sixth was a small one, about 50 ft. long, and was built of
large stones. The seventh was a small one, about 50 ft. long,
and was built of rough stones, and the eighth was a large one,
about 150 ft. long, and was built of large stones, and the
ninth was a small one, about 50 ft. long, and was built of
large stones. The tenth was a small one, about 50 ft. long,
and was built of rough stones, and the eleventh was a large one,
about 150 ft. long, and was built of large stones, and the
twelfth was a small one, about 50 ft. long, and was built of
large stones. The thirteenth was a small one, about 50 ft. long,
and was built of rough stones, and the fourteenth was a large one,
about 150 ft. long, and was built of large stones, and the
fifteenth was a small one, about 50 ft. long, and was built of
large stones. The sixteenth was a small one, about 50 ft. long,
and was built of rough stones, and the seventeenth was a large one,
about 150 ft. long, and was built of large stones, and the
eighteenth was a small one, about 50 ft. long, and was built of
large stones. The nineteenth was a small one, about 50 ft. long,
and was built of rough stones, and the twentieth was a large one,
about 150 ft. long, and was built of large stones, and the
twenty-first was a small one, about 50 ft. long, and was built of
large stones.

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4. Detailed stratigraphic studies, which must be based upon knowledge of the physical characteristics and chemical composition of individual layers, are required for estimation of reserves or deciphering the areal variations in and origin of the various layers.

Because of the great lateral continuity of individual layers, and the large area to be covered, it has been deemed sufficient to sample the complete thickness of the formation at intervals of 3 to 6 miles. As natural exposures are extremely rare, the rocks must be exposed artificially at most localities; this has been done generally by bulldozer-trenching, but in some places the beds have been sampled in underground workings. Diamond drilling has been attempted, but the poor core recovery obtained (30-85 percent) makes it unsatisfactory for sampling.

The beds exposed are described and measured, and, in addition to the channel samples cut from each, chip samples are collected from every bed, and fossils, which are an aid in correlation and hence in calculation of reserves, are collected wherever possible. Many of the logging and sampling techniques have been highly systematized, but as these would have to be modified for use on another formation, they need not be described here. The field use of the Geiger counter is adequately described elsewhere (Faul).

Both radiometric and chemical analyses have been made on each sample. Radiometric analyses are somewhat higher, but the agreement between the two methods is relatively close (fig. 21).

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Cognitive bias

• Cognitive bias = systematic error in the way we process information

• Biases are often unconscious, automatic, and hard to control or change

• Biases can lead to poor decisions, bad judgments, and inaccurate beliefs

• Biases are often based on stereotypes, heuristics, and other cognitive shortcuts

• Biases can be influenced by culture, gender, race, and other social factors

• Biases can lead to discrimination, stereotyping, and other negative outcomes

• Biases can be reduced through education, training, and other interventions

• Biases are a normal part of human cognition, but they can be problematic

• Biases can be overcome by being aware of them and taking steps to counteract them

• Biases can be reduced by using objective criteria and avoiding subjective biases

• Biases can be overcome by being aware of them and taking steps to counteract them

• Biases can be reduced by using objective criteria and avoiding subjective biases

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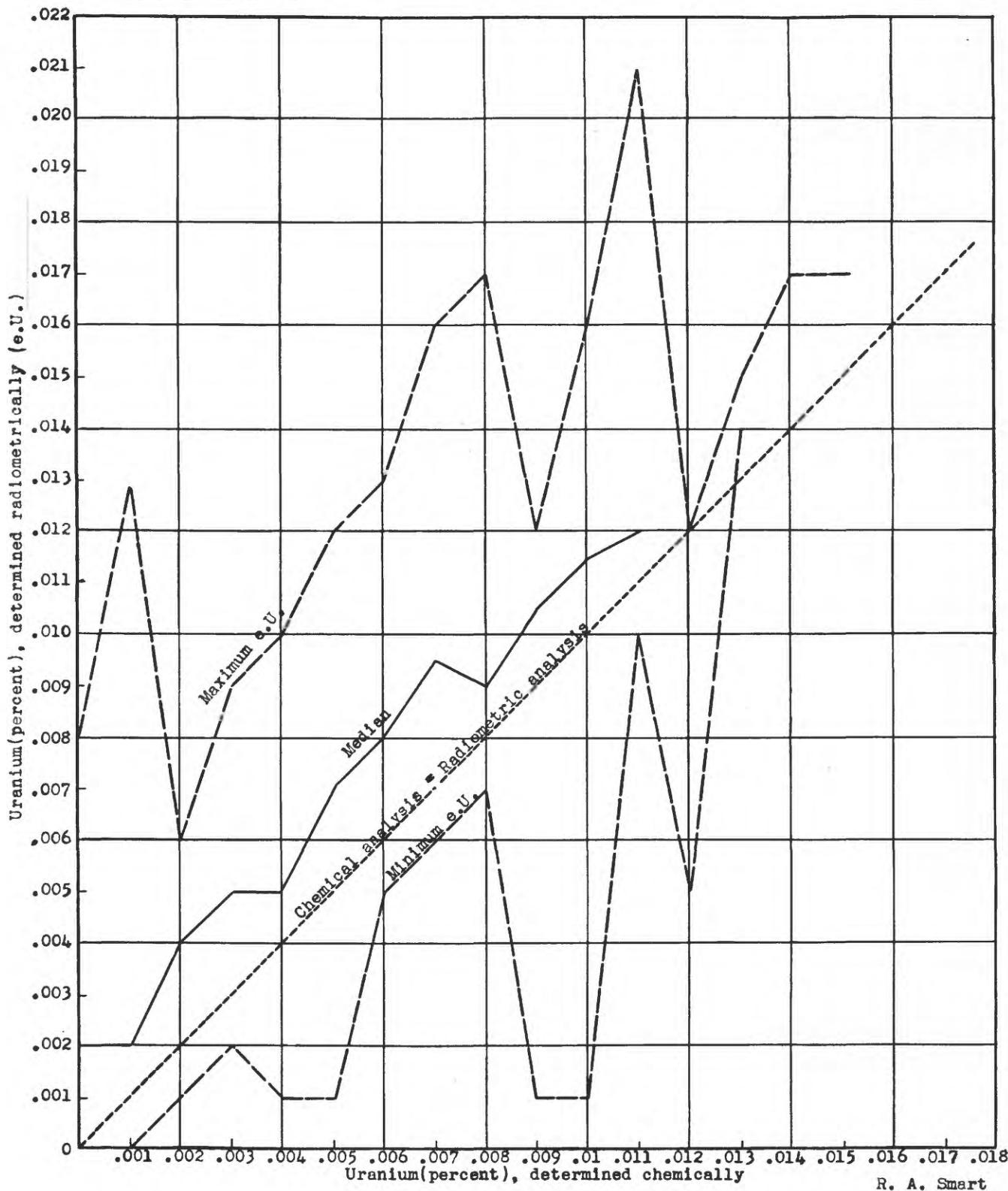
• Biases can be overcome by being aware of them and taking steps to counteract them

• Biases can be reduced by using objective criteria and avoiding subjective biases

• Biases can be overcome by being aware of them and taking steps to counteract them

• Biases can be reduced by using objective criteria and avoiding subjective biases

Cognitive bias

R. A. Smart
May 1949

COMPARISON BETWEEN CHEMICAL AND RADIOMETRIC URANIUM ANALYSES

Long-dashed lines show extreme discrepancies. Solid line represents the median (i.e. 50 percent of the samples fall above and 50 percent fall below the median line). Line along which analyses would fall if both chemical and radiometric analyses were equal is short-dashed. Of the available analyses (667), 75 percent contain less than 0.005 percent Uranium. All analyses are of samples from the Phosphoria formation and its close stratigraphic equivalents.

SUGGESTIONS FOR PROSPECTING
FOR URANIFEROUS PHOSPHATE IN OTHER AREAS

Phosphate is concentrated in nature in a wide variety of rocks and by many different processes. The principal types of primary deposits are: (1) sedimentary "bedded deposits", (2) guano, and (3) apatite, in lenses, veins, or other igneous differentiates. Important secondary concentrations are formed from guano (phosphatized limestones) and sedimentary deposits (residual and reworked deposits).

Uranium, in amounts of 0.01 percent or more, thus far has been reported only from the marine sedimentary deposits, and not all of these contain such an amount of uranium. On the other hand, smaller amounts of uranium have been detected in non-sedimentary deposits. In view of the wide association of uranium with phosphate, not only in the bedded phosphate rock, but in primary and secondary vein minerals (e.g., autunite and torbernite), all phosphorite ought to be tested. Accordingly, the mode of occurrence of all the principal types of phosphate deposits is described briefly here.

Guano deposits

Guano, composed of the droppings of sea fowl, has been an important source of agricultural phosphate. Its value arises not only from the ease with which it can be mined and its favorable location with respect to tide water, but also from its content of available phosphate and nitrogen.

Guano deposits are found mainly on islands in the tropics, such as those off the coasts of Peru, Ecuador, Mexico, China, and Japan and

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TO YOUR QUESTION
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various Pacific islands; they are also found on the mainland, near the coast, in Peru, Ecuador, and Columbia. Some of these deposits are being actively built now, but other guano areas have been abandoned by the birds that made the deposits.

If the marine organisms (mostly fish) on which the birds feed, concentrate uranium, concentrations of uranium might be expected in the guano deposits. In view of the relatively low phosphate content of the guano deposits and the extent of their dilution by organic matter, it seems unlikely that any of the deposits will be found to contain as much as 0.01 percent uranium. Although known deposits should be tested, the results will be mainly of academic interest unless very large concentrations are found, for as the guano is applied to the soil without processing, it would be uneconomical to attempt to recover uranium in amounts such as are found in most phosphate rocks.

Guano (phosphatized) limestone

Downward migration of the relatively soluble guano phosphate has led to phosphatization of underlying bedrock on many tropical islands. Among the most important of these deposits are those of the Pacific on Angaur, Fais, Kita-daito, Makaten, Nauru, and Ocean Islands, but smaller deposits are found in many other places, especially the Indian Ocean (Rodgers, Mansfield, 1942). Most of the deposits are phosphatized limestones, but in some places where the underlying bedrock is non-calcareous, aluminum phosphate or ferrous aluminum phosphate is found. Examples of the latter are found in the deposits in the vicinity of Saldanha Bay, South Africa; Clipperton Atoll in the Northern Pacific; and Redonie in

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ANSWER

and the other is the *reindeer* which is the most abundant animal in the country. The reindeer is a small deer with long, thin legs, a long tail, and a short, pointed horn. It is found throughout the Arctic region, from the coast of Norway to the coast of Siberia. The reindeer is a very valuable animal, as it is used for food, clothing, and transportation. It is also used for hunting, as it is a good target for hunters. The reindeer is a very important animal in the Arctic region, as it is the main source of food for the native people.

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the West Indies (du Toit).

Of the few specimens of guano limestone that have been tested for uranium by the Geological Survey, that from Makatea Island contained the most - 0.007 percent. The others (from Angaur, Maura, and Ocean Islands) contained only negligible amounts. Whether or not any of these guano-limestone deposits contain significant amounts of uranium depends mainly on whether or not the guano itself is uraniferous, or whether the deposits have been exposed to sea water since their formation. Some of the deposits are found on elevated islands, which show evidence of repeated uplift, and it seems probable that phosphatization of the underlying rock can take place only above the water table (Rodgers, p. 407). If, however, any of these islands have been submerged for even short periods since the formation of the phosphatized limestone, the phosphate may have adsorbed some uranium from sea water. Even so, unless the deposits were actually reworked (and I know of none which show any of the characteristics of reworked deposits), it seems unlikely that the phosphate would be highly uraniferous because of the relatively small amount of surface that would have been exposed to the sea water.

The known reserves of insular phosphates are small and are not promising sources of uranium.

Apatite deposits

The largest and most important apatite deposits are late stage igneous differentiates, associated with alkaline rocks. The two most important apatite deposits are those at Kirovsk on the Kola Peninsula of Russia (Fiveng, 1937), where the apatite is associated with khibinitite, foyaite,

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INTRODUCTION

During the last two decades, there has been a significant increase in the number of studies on the effects of environmental pollutants on the nervous system. This is due to the fact that the nervous system is particularly sensitive to toxicants. The brain and spinal cord are especially vulnerable to damage by environmental pollutants because they are relatively immobile and have limited ability to repair damage. In addition, the blood-brain barrier, which protects the brain from many harmful substances, can be easily breached by certain pollutants. The nervous system is also highly sensitive to changes in its environment, such as temperature and oxygen levels. These factors, along with the complex structure and function of the nervous system, make it particularly susceptible to damage by environmental pollutants.

Environmental pollutants

There are many different types of environmental pollutants that can affect the nervous system. Some common ones include lead, mercury, arsenic, and polychlorinated biphenyls (PCBs). Lead is a well-known neurotoxin that can cause cognitive impairment, memory loss, and other neurological problems. Mercury can also cause neurological damage, particularly in children. Arsenic is another toxicant that has been linked to nerve damage and cancer. PCBs are synthetic organic compounds that were once widely used in electrical equipment but have since been banned due to their toxicity.

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nephelite syenite, and ijolite; and Uganda (Davies), where the apatite occurs with magnetite and phlogopite, associated with syenite, ijolite, pyroxenite, and carbonatite. Similar deposits (also associated with magnetite or titanium minerals) are found in northern Sweden and with titanium minerals at Magnet Cover, Arkansas; Nelson County, Virginia; Kragero and Bamla, in southern Norway; and many other localities over the world.

Only a few museum specimens of apatites have been tested by the Geological Survey for uranium, and none of these contained more than a trace. In view of the wide association of uranium with phosphate in other types of deposits, more extensive tests are needed before the apatites can be eliminated as possible sources of small quantities of uranium. Unlike the guano and phosphatized limestone deposits, some of the apatite deposits are very large (millions or even billions of tons) and as the phosphate rock must be processed before it can be used, significant quantities of uranium might be recovered as a by-product. The apatite deposits therefore deserve more consideration as possible sources of uranium than they have received to date.

Sedimentary deposits

Minor occurrences of phosphate in sedimentary rocks have been reported from scores of localities over the world, but known large, thick, high quality deposits are few indeed--the North African Cretaceous-Tertiary deposits are apparently the only deposits which compare in size and quality with those of the Phosphoria formation. Although the Florida

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INTRODUCTION

Interest in the study of the relationship between the environment and health has increased in recent years, and there is now a large literature on the subject.

The following review of the literature on environmental health hazards and health effects is intended to provide a general overview of the field, and to highlight some of the more important findings from the available literature.

The review is organized into three main sections: (1) environmental health hazards; (2) environmental health effects; and (3) environmental health risks. The first section covers the identification of environmental health hazards, and the second section covers the identification of environmental health effects. The third section covers the identification of environmental health risks.

The review is based on a search of the literature, and it is intended to provide a general overview of the field, and to highlight some of the more important findings from the available literature.

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deposits are of smaller size and thickness and of lower quality, they are currently the most productive because they are easily mined and beneficiated.

Although small quantities of phosphates are concentrated in certain lacustrine and bog deposits, most sedimentary phosphates are marine. The largest deposits are associated with geosynclinal facies of which the preceding description of the Phosphoria may be taken as representative. It seems likely that few additional deposits of this type remain to be discovered, but they should be searched for geosyncline-wards from known deposits of the platform type. A clue as to the location of the most favorable ground for prospecting may be provided by the regional structure for, in both the Cordilleran and Appalachian areas, as well as many other geosynclinal areas over the world, the division between areas of simple, irregular structure and those of lineated, complex structure roughly approximates the division between platform and geosynclinal facies.

Most of the minor sedimentary deposits are associated with platform facies. Many of them are associated with unconformities or periods of slight or nondeposition, and some bear evidence of reworking (worn phosphate pebbles and worn and fragmented fossils). Glauconite, clean quartz sands, and clastic limestones containing well sorted and well worn fossils are common lithologic companions. The phosphate itself is generally nodular, and much of it is in the form of phosphatized fossil invertebrates, bones, or fish teeth. Examples of such deposits are those

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of the Tertiary Hawthorn and the overlying Bone Valley formation in Florida (Mansfield, 1943; Matson) and beds of the same age in South Carolina (Rogers); the Devonian Bishop Brook formation in New York; the Devonian Oriskany formation in Pennsylvania (Ihlsang) and Virginia (Stose); the Devonian-Missippian Hardin sandstone member of the Chattanooga shale in Tennessee, commonly known as Tennessee blue rock (Mansfield, 1940b); the Lower Cambrian Yunnan type in China (Haith); and Haith and Chao); and many of the Russian deposits (Kazakov, p. 98; see also many of the other papers in the same volume).

Phosphatic nodules are also associated with many black shales, and some of those tested in this country are known to be highly uraniferous. Examples include those in shales of the Pennsylvanian Bogshooter limestone; the Checkerboard limestone, the Fort Scott limestone, and the Boggy formation; and the Devonian (?) Woodford chert in Oklahoma (Cakes).

Minor concentrations of phosphorus are also associated with many manganese and iron deposits of the platform or platform-miogeosynclinal type--not the eugeosynclinal type. Examples of these include the manganese deposits in the Ordovician Cason shale of Arkansas and the Devonian Oriskany formation of Virginia; and the iron deposits of the Silurian Clinton formation of the Appalachians and the Alsace-Lorraine of France.

Nonmarine residual phosphates

Inasmuch as most natural phosphates are insoluble except in acid or very weakly basic solutions, residual phosphates are rather common. Some of these, such as parts of the Bone Valley formation, are concentrated or reworked in submarine environments and, possibly because of this exposure to sea water (McElvey and Nelson), are as uraniferous as some of the

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Introduction

The present paper is a continuation of the work done by the author in 1962.

In 1962, the author had collected a number of samples from the

area around the town of Kharagpur and had studied the

samples to determine the nature of the soil - texture, organic

matter, mineral composition, etc. The results of the study

are given in the previous paper (Bhattacharya, 1962). The

present paper deals with the properties of the soils of the

area around the town of Kharagpur and the properties of the

soils of the area around the town of Durgapur and the

area around the town of Raniganj. The properties of the

soils of the area around the town of Durgapur and the

area around the town of Raniganj have been reported by

the author in a previous paper (Bhattacharya, 1962).

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of the soils of the area around the town of Kharagpur and the

properties of the soils of the area around the town of Raniganj

have been reported by the author in a previous paper (Bhattacharya,

Conclusion

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primary deposits. But of those deposits that have been concentrated on land, such as the brown and white phosphates of Tennessee, all tested thus far have been found to be nearly barren of uranium. This may be because any uranium present in the phosphatic rocks (from which the secondary concentrations were derived) was leached out. Most of the parent rocks are phosphatic limestones and, in view of the strongly negative correlation observed between uranium and carbonate in the rocks of the Phosphoria formation, and in some of the black shales as well, it seems more likely that the parent phosphates were non-uraniferous.

Even though the non-marine residual phosphates do not appear to be promising sources of uranium, they ought to be tested further.

CONCLUSION

The general origin of the various types of phosphate deposits is well enough known to guide exploration, not only for the phosphate deposits themselves, but for uranium in the phosphates. Of the various types currently mined, those that seem to deserve most attention as possible sources of uranium are the apatites and the geosynclinal phosphates, and in general, non-calcareous phosphates. In view of the fact that the expectable concentrations of uranium in the phosphates are low, further search for uraniferous phosphates seems best directed toward deposits which can be mined and beneficiated cheaply, like some of the nodular deposits, or to those which contain other valuable materials, such as oil, manganese, or iron.

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2. Theoretical framework
3. Data and methods
4. Results
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Contributors

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Many geologists, mineralogists, and chemists of the Geological Survey, too numerous to mention here, have participated in the investigation of the uraniumiferous rocks of the Phosphoria formation. Deserving of especial mention, however, are W. W. Rubey, A. P. Butler, F. C. Armstrong, M. H. Klepper, L. E. Smith, W. R. Lowell, D. P. Davidson and R. A. Smart among the geologists; and Michael Fleischer, F. S. Grimaldi, J. C. Rabbitt, and Theodore Botinelly, among the mineralogists and chemists. R. A. Smart, R. G. Waring, R. A. Harris, and F. J. Anderson assisted in the compilation of the illustrations accompanying this report.

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